

THE PAN-PACIFIC ENTOMOLOGIST



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THE PAN-PACIFIC ENTOMOLOGIST

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THE DOUGLAS-FIR TUSSOCK MOTH IN CALIFORNIA

(Lepidoptera: Liparidae)

CHARLES B. EATON AND GEORGE R. STRUBLE

California Forest and Range Experiment Station,¹ Forest Service,
U.S. Department of Agriculture

White fir, *Abies concolor*, in California is periodically defoliated by a tussock moth belonging to the genus *Hemerocampa* Dyar. For nearly 50 years it has been thought that the species causing the damage was *Hemerocampa oslari* (Barnes), commonly called Oslar's tussock moth (Doane et al, 1936; Essig, 1926; Keen, 1952; Patterson, 1938). A recent reappraisal of the *Hemerocampa* species which attack fir, however, indicates that the species is *Hemerocampa pseudotsugata* McDunnough, the Douglas-fir tussock moth, and that records of the occurrence of *Hemerocampa oslari* in this State are in error.

This change in names is the result of a taxonomic study made by E. L. Todd² in January, 1956. Todd compared specimens of tussock moths from white fir, which were submitted by the California Forest and Range Experiment Station, with other *Hemerocampa* material in the U.S. National Museum. He concluded that the so-called *Hemerocampa oslari* from California is actually *Hemerocampa pseudotsugata*. Todd based this conclusion on characters of the genitalic structures of the male type of *Hemerocampa oslari*, a male paratype of *Hemerocampa pseudotsugata*, and related material.

Hemerocampa oslari was originally described by Barnes in 1900. According to P. W. Oman,³ it is known only from a single specimen, the male type from Poncha Springs, Colorado.

Hemerocampa pseudotsugata was described by McDunnough in 1921. However, Balch (1932) states that the insect was first reported from Chase, British Columbia, in 1918. It was then identified by Blackmore (1919) as a variety of *Hemerocampa vetusta* (*H. vetusta gulosa* Hy. Edwards). According to Balch,

¹ Maintained at Berkeley, California, in cooperation with the University of California.

² Insect Identification and Parasite Introduction Section, Entomology Research Branch, Agricultural Research Service, U. S. Dept. of Agriculture.

³ Insect Identification and Parasite Introduction Section, Entomology Research Branch, Agricultural Research Service, U. S. Dept. of Agriculture.

the species was not recognized in the United States until 1927, when it was reported defoliating alpine fir near Jarbridge, Nevada.

Both of these reports are antedated by many years by California records. H. E. Burke collected the tussock moth from white fir and pines at Summerdale (now Fish Camp), Mariposa County, in August, 1906. At that time the insect was considered to be *Hemerocampa (Notolophus) oslari* (Barnes). Some of Burke's specimens were deposited in the U.S. National Museum collection, and these have since been identified as *Hemerocampa pseudo-tsugata* McDunnough. The species, therefore, can be considered a native forest pest of California, one that the State has unknowingly harbored for many years.

The Douglas-fir tussock moth is a well known enemy of Douglas-fir and true fir forests of the Pacific Northwest and the northern Rocky Mountain regions. Its range up to the present has been considered to be British Columbia, Washington, eastern Oregon, Idaho, Colorado, and Nevada. To this list should be added northeastern California. The species has been collected in widely separated localities throughout the northern part of the Sierra Nevada mountains, from Modoc County southward to Mono and Mariposa Counties.

The insect is a defoliator only in the larval stage. Its principal hosts are Douglas-fir and various species of true firs (Balch, 1932). In California white fir is the most frequently attacked. The larvae have occasionally been found feeding on various species of pines in this State, but have never been recorded from Douglas-fir here.

The biology of the Douglas-fir tussock moth is fairly well known. Its life history and habits were described in some detail by Balch in 1932. More recently, Keen (1952) published an account of the life cycle.

The Douglas-fir tussock moth is a potential threat to the fir forests of California. From records of its activities in the northern part of its range, we know that several major outbreaks have occurred over the past 30 years in forest types similar to those here. Some of these outbreaks have resulted in the death of large volumes of timber. Much of it died from defoliation. The remainder, weakened by being partly defoliated, later succumbed to bark beetles. One of the most recent large outbreaks developed in 1946 and 1947 over 500,000 acres in the fir forests of northern Idaho,

northeastern Oregon, and eastern Washington. This outbreak was the occasion for the first successful attempt to use airplane application of DDT on a large scale to control a forest insect.

Tussock moth outbreaks in California have been recorded from time to time, but none has been so extensive or so devastating as those elsewhere. One of the earliest recorded outbreaks in the State is reported to have taken place about 1906 in Tuolumne County. This outbreak was confined to white fir on the western slopes of the Sierra Nevada range. Between 1931 and 1938, another outbreak occurred in the Mammoth Lakes region, Mono County. In this outbreak, infestations developed in four widely separated centers. Each of these centers contained from 1,000 to 2,500 acres. White fir was the principal tree species affected, although some Jeffrey pine intermingled with the fir was also attacked. The most recent tussock moth outbreak in California is one that is currently in progress in Tuolumne County. This outbreak was first detected in 1954, but it probably originated somewhat earlier. Within the outbreak area, seven centers of infestation have been located, ranging from 350 to 5,900 acres in size. All are in white fir. The defoliated white firs in these centers extend over a combined area of about 10,000 acres.

The development of Douglas-fir tussock moth epidemics in California has not been studied closely. Consequently, factors that influence fluctuations of tussock moth population here are not well known. Biotic factors, particularly parasites and pathological organisms, are known to be important elsewhere. Undoubtedly, they play a comparable part in limiting outbreaks in California. When natural controls fail, it is reasonable to expect from the control work done in Idaho, that DDT insecticides can be used effectively to check outbreaks here.

To summarize, the tussock moth that periodically defoliates white fir forests in California is now considered to be *Hemerocampa pseudotsugata* (McDunnough), rather than *H. oslari* (Barnes) as has been supposed for many years. Contrary to published records, *H. pseudotsugata*, commonly called the Douglas-fir tussock moth, is a native pest of long standing in this State. The insect is potentially very destructive to mature timber. Outbreaks in northwestern United States have resulted in considerable timber mortality. In California, local outbreaks have developed periodically in the northern part of the Sierra Nevada range, but

none so damaging as those elsewhere. Aerial application of DDT is known to be effective for controlling this pest.

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BOOK NOTICE

THE ARMORED SCALE INSECTS OF CALIFORNIA, by Howard L. McKenzie. Bull. Calif. Insect Survey, Vol. 5, pp. i-x + 1-210, pls. 1-3 (= pp. vi-viii), 133 text figs. Offset printed. University of California Press, Berkeley and Los Angeles. Published August 30, 1956. Price \$6.00 (cloth), \$4.50 (paper).

This paper treats of the homopterous family Diaspididae of California. Page ii is a map of the state, showing county boundaries; pp. vi-viii are plates in color, each consisting of nine photographs of scale-infested plant parts, all but one shown natural size. Identification keys are on pp. 21-37, followed by the illustrated species treatments, each giving synonymy, hosts, differentiation, and distribution in California. Pp. 173-192 contain a host list arranged alphabetically by plant families, pp. 193-201 a cross-reference index of the common and scientific names of hosts.—HUGH B. LEECH.

R A NEW ENTEDONTINE CHALCID-FLY FROM SEED
CAPSULES OF EUCALYPTUS IN CALIFORNIA¹

(Hymenoptera: Eulophidae)

P. H. TIMBERLAKE

University of California Citrus Experimental Station, Riverside

The discovery of a phytophagous chalcid-fly attached to *Eucalyptus* in California is of unusual interest because it is the first known species of insect that must have been introduced into California with this host plant. This chalcid-fly was first brought to my attention in January, 1954, by R. A. Flock, who reared it from seed capsules of *Eucalyptus umbellata* (Gaertn.) Domin. It is described herewith as a new genus and species.

Flockiella Timberlake, new genus

In Ashmead's keys (1904) this insect runs to the Omphalini and runs out strictly at couplet 2, but if continued on it agrees best with the characters of *Euderus* as given in the key. In Girault's keys (1913) it agrees best with the Omphalini group of the Entedontinae and runs near the genera *Rhicnopeltella* and *Rhicnopeltomyia*. It differs from those genera in having four grooved lines on the scutellum, a median grooved line on meso-scutum, and twelve-jointed antennae with four ring joints.

Female: Parapsidal furrows deep and complete, the mesoscutum also with a fine, impressed median line. Scutellum large, pulvinate, with two impressed submedian lines and also an impressed line on each side. Propodeum smooth, without carinae, and hardly longer in the middle than the metanotum. Abdomen sessile, elongate oval, depressed above, about as long as the head and thorax together, with six distinct dorsal segments; last five segments about equal and each but little more than half as long as the first. Ovipositor sheaths rather massive but only very shortly protruded. Tarsi four-jointed. Antennae twelve-jointed, with four ring joints, three funicle joints, and three club joints; pedicel large, more than half as long as the scape and somewhat longer than the ring joints and first two funicle joints combined (Fig. 1). Fore wing with a short, fine marginal fringe and moderately close discal setae except on narrow part of disk below the submarginal vein. Marginal and submarginal veins long and equal, about four times as long as the stigmal, the submarginal broken; stigmal and postmarginal veins about equal, the former very slender and colorless at base, only slightly widened apically, and with a slender beak.

Type of genus: *Flockiella eucalypti* Timberlake.

This genus is dedicated with much pleasure to my esteemed colleague, R. A. Flock, who discovered it.

¹ Paper No. 955, University of California Citrus Experiment Station, Riverside, California.

Flockiella eucalypti Timberlake, new species

Female: Dark brassy green, becoming more coppery on the face. Antennae brown. Legs pale brownish yellow, a cloud on posterior side of front and middle femora, hind femora, except apical fourth, and apex of all tarsi, fuscous. Wings hyaline, the nervures fuscous. Head longer than wide, the malar space equal to length of eyes. Ocelli widely separated, posterior pair close to occipital border and the margin of eyes. Antennae a little longer than head, only slightly clavate, flagellum thickest at basal club joint; first ring joint distinct, the others very thin; the three funicle joints increasing very slightly in size distad; club conical in outline, the three joints subequal in length and, together, almost as long as funicle and ring joints

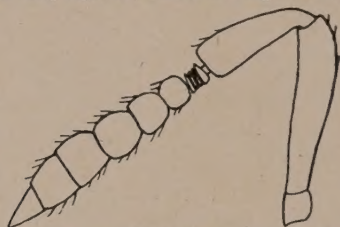


Fig. 1. Antennae of *Flockiella eucalypti* Timberlake.

combined. Axillae large, more than half anterior to basal line of scutellum, the suture between them and scapulae almost exactly bisecting the parapsidal furrows. Scutellum large and broad, about as wide as long, with area between the two submedian grooves twice as long as wide. Legs rather slender, with femora slightly swollen; first three joints of tarsi subequal, fourth joint stouter and a little longer than the others, and with small claws and a large pulvillus. Head, thorax, and abdomen shining, minutely tessellate, but face and propodeum polished. Length, about 1-1.8 mm.; anterior wing almost equaling length of body or about 0.9-1.7 mm.

Male: Unknown.

Described from 141 females (holotype and paratypes) reared in January and February, 1954, from seed capsules of *Eucalyptus umbellata*, collected at the CITRUS EXPERIMENT STATION, RIVERSIDE, CALIFORNIA by R. A. Flock. The type in Station collection at Riverside, but paratypes or additional material will be widely distributed.

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A REVISION OF THE BEE GENUS *CROCISA* IN THE
PHILIPPINES

(Hymenoptera, Apidae)

FRANK P. SIVIK

Raleigh, North Carolina

The bee genus *Crocisa* (subfamily Anthophorinae, tribe Melectini) is distributed throughout the entire Eastern Hemisphere. This study is limited to those species in the Philippines, where there are five known species, one of which is described as new in this paper. The genus is easily distinguished from other bees by the scutellum, which is flat, projecting posteriorly like a roof, and with a median apical emargination. In the Philippines it is the most highly ornamented genus, being remarkable for its metallic bluish markings.

Cockerell (1910, 1919) described four species of *Crocisa* from the Philippines, using color and a very few structural characteristics. His keys and descriptions are somewhat unsatisfactory, and one of the writer's aims is to redescribe the Cockerell species, emphasizing the more stable structural and color characteristics, so that future workers may have a better understanding of the species. Meyer (1921), in his general monograph of *Crocisa*, has 117 described species, including two of the four Philippine species described by Cockerell. It is doubtful that he saw these two Philippine species, as his descriptions of them are almost copies of those by Cockerell.

In this revisional study the writer was fortunate in obtaining most of the available specimens of *Crocisa* from the Philippine Islands. During World War II the insect collections in the Philippines were destroyed; so the specimens received from that country have been collected since the war. The writer has been to Washington to see the Philippine *Crocisa* material in the Baker Collection, as well as other specimens of the genus, and while there saw the type and paratype of *C. crucifera*; also specimens of other species described and determined by Cockerell.

The work as a whole has been done under the supervision of Dr. Henry K. Townes, and the writer wishes to express his thanks for this assistance and encouragement. I would also like to thank his family, who collected and returned from the Philippines with these spectacularly beautiful bees and permitted me to work on them. The writer is indebted to Dr. Theodore B. Mitchel in

assuming responsibility for loaned specimens from the U.S. National Museum and for advice and other assistance—also to Mr. Santiago R. Capco of the Bureau of Plant Industry, Manila, and to Dr. S. M. Cendaña of the College of Agriculture, Laguna, Philippines, for sending their collections for study.

Genus *CROCISA* Jurine

Crocisa Jurine, 1801, Erlangen Litteratur-Zeitung, vol. 1, p. 164. Three species.

Type: *Nomada scutellata* (= *Melecta histrionica* Illiger, 1806 = *Nomada scutellaris* Fabricius, 1781). (By designation of Morice and Durrant, Trans. Ent. Soc., London, p. 423, 1915.)

Thyreus Panzer, 1806, Kritische Revision de Insektenfaune Deutschlands, vol. 2, p. 263, 1806. Type: *Nomada scutellaris* Fabricius, 1781 (Monobasic).

Crocissa Panzer, 1806, Kritische Revision de Insektenfaune Deutschlands, vol. 2, p. 263, 1806. *Lapsus* for *Crocisa* Jurine, 1801.

Head transverse, narrower than thorax; labrum free, four-cornered, with two lateral basal elevations; mandible with inner margin bidentate; eyes strongly narrowed and contracted above; antenna filiform; labial palpus four-segmented, the basal segment elongate, full half the length of the prementum, the second less than half the length of the first, the third and 4th short; maxillary palpus two-segmented; scutellum flat and medially emarginate; basitibial plates absent; fore wing with radial cell narrow, rounded at base and apex; three submarginal cells, the first measured on the cubital vein about equal in length to the second and third united; pubescence of either scale-like or plumose hairs; female with pygidial plate rounded apically.

Crocisa is similar to *Melecta* but is distinguished by having a flat, expanded scutellum which is medially emarginate posteriorly, and the maxillary palpus two-segmented; *Melecta* has dorsal lobes of scutellum armed with a tooth or spine, and has the maxillary palpus five-segmented or with a short sixth segment. The species of *Crocisa*, as far as known, are parasites in the nests of *Anthophora*.

Up to the present time, two names have been proposed for the genus: *Crocisa* Jurine, 1801 and *Thyreus* Panzer, 1806. The genus *Crocisa* was first named in the "Erlangen List" published at Erlangen, Germany, in May, 1801. This article contains a synoptic list of the Panzer-Jurine genera, comparing them with the genera adopted by Fabricius. Although written by Panzer the authorship of all of the new names is accredited to Jurine. In 1939, in its Opinion 135, the International Commission of Zoological Nomenclature suppressed the Erlangen List, stating that adopting the new names contained therein would result in greater con-

fusion than uniformity, and that the paper therefore should be treated as though it had never been published. However, *Crocisa* is a well-known name, validly proposed, and associated with an extensive literature. It should not be discarded for arbitrary reasons. The writer is not in agreement with the International Commission's opinion that the Erlangen List should be considered as unpublished and he favors continuing the use of the generic name *Crocisa*.

KEY TO THE PHILIPPINE SPECIES OF THE GENUS CROCISA

1. Bluish body hairs plumose; hind femur of male (as far as known) without median ventral angle 2
- Bluish body hairs scale-like; hind femur of male with median ventral angle 4
2. Scutellum with one whitish-blue spot, at point of apical incision; hair fringe present underneath at point of scutellar emargination; wings light fuliginous, with membrane lighter than the veins.....*irisana* Cockerell
- Scutellum entirely black, without a spot; hair fringe absent underneath at point of scutellar emargination; wings dark fuliginous, with membrane about as dark as the veins.....3
3. Longitudinal bluish patch on median mesoscutal line about 0.3 length of mesoscutum; scutellum with depth of apical notch about 0.1 its breadth, notch not sharper medially, its sides almost straight; dorsal transverse color band on first metasomal segment interrupted medially by a longitudinal black band.....*janasivia* Sivik, new species
- Longitudinal bluish patch on median mesoscutal line about 0.6 length of mesoscutum; scutellum with depth of apical notch about 0.14 its breadth, notch sharper medially, its sides sinuate; dorsal transverse color band on first metasomal segment continuous medially.....*luzonensis* Cockerell
4. Scutellum with two blue spots, one on each lobe; dorsal transverse color band on first metasomal segment interrupted medially by an irregular-shaped longitudinal black band*crucifera* Cockerell
- Scutellum entirely black, without spots; dorsal transverse color band on first metasomal segment continuous medially but with a basal black notch*caelestina* Cockerell

CROCISA IRISANA Cockerell

(Figures 4, 7)

Crocisa irisana Cockerell, 1910. Entomologist 43:219. ♀

Female.—Fore wing about 10 mm. long. Supraclypeal area with keeled frontal line about 0.4 length of face; clypeus very minutely punctured; mandible with small rounded tooth on inner margin about 0.45 length of mandible from apical end, and with another small tooth about 0.7 from apical end; flagellar segments two to nine each with a deep longitudinal indentation on outer lateral surface; scutellum with depth of apical notch about 0.25 its breadth, its sides almost straight (figure 4). its dorsal surface moderately punctured with plumose hairs thickly branched; tegula minutely punctured; apical half of outer lateral border of malus serrated, apical spine

of malus about 0.3 length of malus; mid coxa with anterior carina extending about 0.5 to 0.7 from apex toward episternum; median ventral carina on hind femur extending almost entire length of the femur. Black, with whitish-blue markings of plumose hairs as follows: entire paraocular area and supraclypeal area; basal 0.4 of clypeus; scattered few hairs on labrum and within the ocellar triangle; entire genal area and post-occipital ridge; two transverse spots, 1.2 to 1.5 mm. long, on pronotum and adjacent ones, 0.9 to 1.2 mm. long, on mesocutum; four rounded spots, 0.4 to 0.7 mm. in diameter, on mesoscutum; a spot, 0.4 to 0.6 mm. in diameter, on scutellum at point of apical incision; hair fringe underneath scutellum at point of emargination; a lateral longitudinal patch on mesoscutum above tegula, about 0.5 mm. long; a spot on apical 0.4 of tegula; upper 0.6 of epimeron; scattered few hairs on mesosternum and on upper 0.3 of metapleuron; outer surface of fore, mid and hind tibiae (extending almost or quite the full length on the fore tibia, about 0.5 the length on the mid tibia and about 0.6 the length on the hind tibia); scattered few hairs on trochanters; entire outer surface of metatarsus; a spot on outer lateral apical surface of mid and hind femur; broad transverse bands, interrupted in the middle, on first to fifth dorsal metasomal segments, the first band broadest and its median interruption rhomboidal, apical margin on first dorsal metasomal segment and basal margin on the second to fifth dorsal metasomal segments without blue hairs; scattered few hairs on the sternites. Wings light fuliginous.

Male.—Similar to the female except for the usual sexual differences and as follows: fore wing about 9 mm. long; supraclypeal area with keeled frontal line about 0.35 length of face; flagellar segments two to ten each with a deep longitudinal indentation on posterior surface; lateral border of malus not serrated, apical spine of malus about 0.2 length of malus; median ventral carina on hind femur extending about half the length of femur.

Specimens examined: ♂, ♀, Isabela, Ilagan, May 6, 1952, S. M. Cendaña (College of Agriculture at Laguna). ♀, Ligao, Albay, March 28, 1949, V. J. Madrid (Bureau of Plant Industry at Manila). ♀, Manila, Robert Brown (U.S. National Museum). ♀, Mount Maquiling, Luzon, C. F. Baker (U.S. National Museum). ♀, Mount Maquiling at 150', Luzon, March 7, 1947, A. Bustillus (College of Agriculture at Laguna). ♀, Mount Maquiling at 960', Luzon, February 22, 1948, P. Alfonso (writer's collection). ♂, Mount Maquiling at 160', Luzon, August 3, 1948, L. B. Uichanco (writer's collection). ♀, Orion, Bataan, July 5, 1953, P. C. Feliciano (Bureau of Plant Industry at Manila).

One species was collected on flowers of *Duranta repens* on Mount Maquiling.

***Crocisa janasia* Sivik, new species**

(Figure 2)

Female.—Fore wing 11 mm. long. Supraclypeal area with keeled frontal

line about 0.38 length of face; clypeus with mixed coarse and minute punctures; mandible with small triangular-shaped tooth on inner margin about 0.45 length of mandible from apical end, and with another small tooth about 0.75 from apical end; flagellar segments two to nine each with a deep longitudinal indentation on outer lateral surface; scutellum with depth of apical notch about 0.1 its breadth, its sides almost straight (figure 2), its dorsal surface moderately punctured, with plumose hairs thickly branched; tegula minutely punctured; apical 0.7 of outer lateral border of malus serrated, apical spine of malus about 0.35 length of malus; mid coxa with anterior carina extending from apex to episternum; median ventral carina extends about 0.8 the length on hind femur. Black, with bluish markings of plumose hairs as follows: entire paraocular area, supraclypeal area and clypeus; scattered few hairs on labrum; entire genal area; postoccipital ridge, interrupted in middle; two transverse spots, 0.8 to 1.0 mm. long, on pronotum and adjacent ones, 0.7 to 0.9 mm. long, on mesoscutum; a longitudinal patch, 0.6 to 0.8 mm. long, on the median mesoscutal line; a spot, 0.3 to 0.5 mm. in diameter, on center of each half of mesoscutum; a lateral longitudinal patch on mesoscutum, above tegula, 0.6 to 0.8 mm. long; a spot, 0.4 to 0.7 mm. in diameter, on mesoscutum in front of each axilla; upper 0.4 of epimeron; a spot, 0.4 to 0.6 mm. in diameter, on anterior center of epimeron; scattered few hairs on mesosternum; outer surface of fore, mid and hind tibiae (extending almost or quite the full length on the fore tibia, about 0.8 the length on the mid tibia and about 0.5 the length on the hind tibia); scattered few hairs on the mid coxa; broad transverse bands, interrupted in the middle, on first to fifth dorsal metasomal segments, the first band broadest with its basal median interruption extending just beyond the ends of the scutellum, its apical interruption about 0.3 that of the basal. Wings dark fuliginous.

Holotype: 1 ♀, SAMAR ISLAND, C. F. Baker (U.S. National Museum).

This specimen appears to be aged, as some of the bluish markings seem to be faded.

CROCISA LUZONENSIS Cockerell

(Figure 1)

Crocisa luzonensis Cockerell, 1919. Ann. Mag. Hist. (8)5:419. ♀

Female:—Fore wing about 13 mm. long. Supraclypeal area with keeled frontal line about 0.5 length of face; clypeus moderately coarsely punctured; mandible with small triangular-shaped tooth on inner margin about 0.4 length of mandible from apical end, and with another small tooth about 0.7 from apical end; flagellar segments two to nine each with a shallow longitudinal indentation on outer lateral surface; scutellum with depth of apical notch about 0.14 its breadth, the notch sharper medially with sides weakly sinuate (figure 1), its dorsal surface sparsely punctured, with plumose hairs thinly branched; tegula minutely punctured; apical 0.7 of outer lateral border of malus serrated, apical spine of malus about 0.3 length of malus; mid coxa with anterior carina extending from apex to episternum; median ventral carina extending almost entire length on hind

femur. Black, with bluish markings of plumose hairs as follows; entire paraculcar area, supraclypeal area and clypeus; scattered few hairs on labrum; entire genal area; postoccipital ridge, interrupted in middle; two traverse spots, 1.5 to 1.8 mm. long, on pronotum; a longitudinal patch, 2.5 to 2.8 mm. long, on the median mesoscutal line; a spot, 0.3 to 0.5 mm. in diameter, on center of each half of mesoscutum; a lateral longitudinal patch on mesoscutum, above tegula, 1.6 to 1.8 mm. long; a lateral spot, 1.4 to 1.8 mm. wide, at apex of mesoscutum; a spot at basal and apical corner of tegula; hair fringe underneath scutellar notch; upper 0.5 of epimeron; scattered few hairs on mesosternum; small lateral apical area on fore and mid femur; outer surface of fore, mid and hind tibiae (extending almost or quite the full length on the fore and mid tibiae, about 0.5 the length on the hind tibia); scattered few hairs on mid and hind coxae and trochanters; entire outer surface of tarsi; a spot on lateral apical surface of fore and mid femur; dorsal part of first metasomal segment except for a median rectangular black area which may be open anteriorly; broad apical bands on second to fourth, but interrupted on the fifth by a median longitudinal black band. Wings dark fuliginous.

Male.—Similar to the female except for the usual sexual differences and as follows: fore wing about 13 mm. long; supraclypeal area with keeled frontal line about 0.4 length of face; flagellar segments two to ten each with a shallow subovate indentation on posterior surface; lateral border of malus not serrated, apical spine of malus about 0.2 length of malus; median ventral carina on hind femur extending about half the length of femur.

Specimens examined: ♀, Imugan, Nueva Vizcaya, C. F. Baker (writer's collection). ♀, Baybay, Leyte, August 17, 1945, D. G. Hall (U.S. National Museum). ♀, Mount Canlaon at 3600', Negros Oriental, May 2, 1953, H. M., and D. Townes (Bureau of Plant Industry at Manila). ♂, Mount Canlaon at 3600', Negros Oriental, May 7, 1953, H. M., and D. Townes (writer's collection).

While preparing the male genitalia of the only male specimen for study, the writer kept it in the potassium hydroxide solution too long, consequently it "cleared" too much.

CROCISA CRUCIFERA Cockerell

(Figures 3, 6)

Crocisa crucifera Cockerell, 1919, Philippine Jour. Sci. 14:198. ♀ and ♂

Female.—Fore wing 9 to 12 mm. long. Supraclypeal area with keeled frontal line about 0.4 length of face; clypeus minutely punctured; mandible with small rounded tooth on inner margin about 0.6 length of mandible from apical end, and with another small tooth about 0.75 from apical end; flagellar segments two to nine each with a deep longitudinal indentation on outer lateral surface; scutellum with depth of apical notch about 0.16 its breadth, its side sinuate (figure 3), its dorsal surface sparsely punctured, with plumose hairs thickly branched; tegula very minutely punctured; apical 0.7 of outer lateral border of malus serrated, apical spine about 0.3 length

of malus: mid coxa with anterior carina extending about 0.3 to 0.5 from apex toward episternum; median ventral carina at about basal 0.3 on hind femur. Black, with bluish markings of predominately scale-like hairs as follows: entire paraocular area, supraclypeal area and clypeus: scattered few hairs on labrum; two small patches within the ocellar triangle: entire genal area; two transverse spots, 1.2 to 1.5 mm. long, on pronotum and adjacent ones, 0.9 to 1.2 mm. long, on mesoscutum: a longitudinal patch, 1.2 to 1.5 mm. long, on the median mesoscutal line; a spot, 0.7 to 0.9 mm. in diameter, on center of each half of mesoscutum; a lateral longitudinal patch on mesoscutum, above tegula, 1.0 to 1.2 mm. long, connecting apically with a spot, 0.9 to 1.1 mm. in diameter; a spot, about 1 mm. in diameter, on each lobe of scutellum; upper 0.5 of epimeron; two areas, mixed with plumose hairs, on mesosternum: outer surface of fore, mid and hind tibiae (extending almost or quite the full length on the fore and mid tibiae, about 0.7 the length on the hind tibia); scattered few hairs on outer sides of fore and mid tarsus, mid and hind coxae and trochanters; broad transverse bands, interrupted in middle 0.15, on first to fifth dorsal metasomal segments, basal margin of first dorsal metasomal segment and both apical and basal margins of second to fifth dorsal metasomal segments without bluish hairs; scattered few hairs on the sternites. Wings dark fuliginous.

Male.—Similar to the female except for the usual sexual differences and as follows: fore wing 8 to 11 mm. long; supraclypeal area with keeled frontal line about 0.35 length of face; flagellar segments two to ten each with a deep longitudinal indentation on posterior surface: lateral border of malus not serrated, apical spine of malus about 0.15 length of malus; median ventral angle at about 0.5 on hind femur.

Types: ♀ (type), Los Baños, C. F. Baker (U.S. National Museum). ♀ (paratype), Los Baños, C. F. Baker (U.S. National Museum).

Specimens examined: Many males and females from the following Philippine provinces: Bataan (Balanga, July 18; Orion, July 5); Batanes (Batan Island, May 1918); Batangas (Cuenca, Feb. 2, 1954; Lipa, Jan. 26); Bukidnon (Musuan, June 24, 1953); Cagayan (Gattaran at 1100', May 19, 1952); Cotabato, (Lagao, Jan. 11, 1954; Parang, Mar. 23); Davao (Davao); Iloilo (Culasi, May 1918); Laguna (Los Baños, Feb. 7, 1954 and June 5, 1953; Mount Banahao; Mount Maquiling, Mar. 18 and May 14); Lanao (Iligan; Kolambugan); Leyte (Maripipi, Aug. 10; Mount Pangasugan at 328', May 19, 1952); Misamis Oriental (Cagayan de Oro); Negros Oriental (Cuernos; Mount Canlaon at 3600', Apr. 30); Palawan (Babuyan, Dec. 6; Puerto Princesa, Oct. 1925 and Dec. 7); Romblon (Sibuyan Island); Samar (Surigao; Quezon (Casagivian) and Zamboanga (Dapitan; Zamboanga). Also from Manila, April 1924 and "N. W. Panay Island."

Flower records on the above specimens include *Antigonon leptopus* and *Muntingia Calabura* on Mount Maquiling at an elevation of 160'.

CROCISA CAELESTINA Cockerell

(Figures 5, 8)

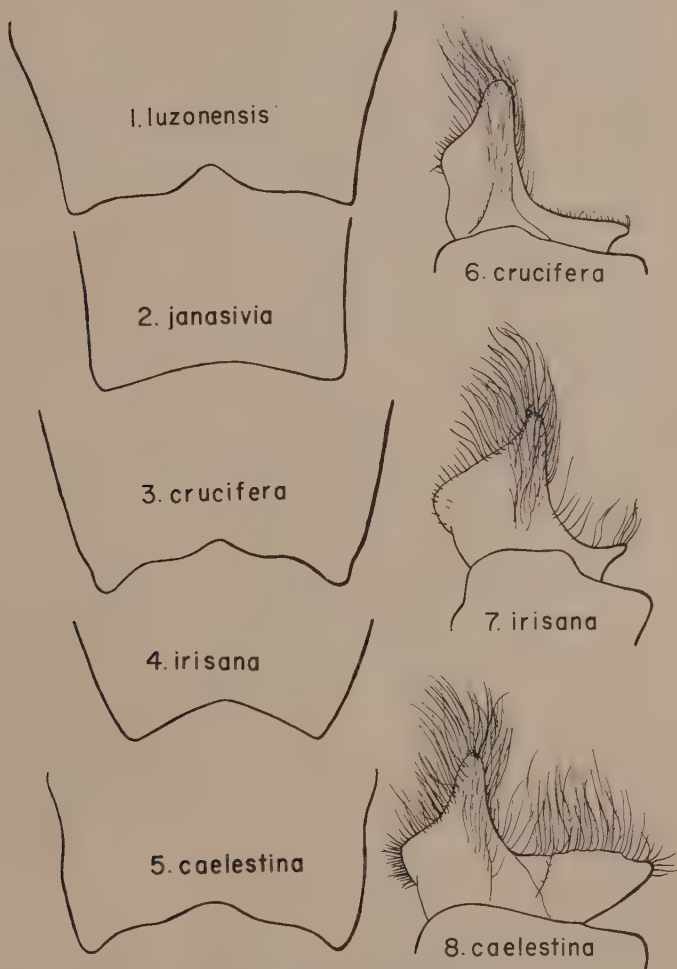
Crocisa caelestina Cockerell, 1919. Philippine Jour. Sci. 14:196. ♀

Female.—Fore wing 11 to 13 mm. long. Supraclypeal area with keeled frontal line about 0.45 length of face; clypeus finely and closely punctured; mandible with triangular-shaped tooth on inner margin about 0.4 length of mandible from apical end, and with another small tooth about 0.7 from apical end; flagellar segments two to nine each with a shallow longitudinal indentation on outer lateral surface; scutellum with depth of apical notch about 0.16 its breadth, its sides sinuate (figure 5), its dorsal surface moderately punctured, with plumose hairs thinly branched; tegula moderately punctured; apical 0.7 of outer lateral border of malus serrated, apical spine of malus about 0.2 length of malus; mid coxa with anterior carina extending about 0.5 to 0.7 from apex toward episternum; median ventral carina at about basal 0.3 on hind femur. Black, with bluish markings of predominantly scale-like hairs as follows: entire paraocular area, supraclypeal area and clypeus; scattered few hairs on labrum; two small patches within the ocellar triangle; entire genal area; two transverse spots, 0.9 to 1.1 mm. long (one specimen measured 1.7 to 1.9 mm. long) on pronotum and adjacent ones, 0.8 to 1.0 mm. long (one specimen measured 1.6 to 1.8 mm. long) on mesoscutum; a longitudinal patch, 1.0 to 1.2 mm. long (one specimen measured 1.3 to 1.5 mm. long) on median mesoscutal line; a spot, 0.5 to 0.7 mm. in diameter, on center of each half of mesoscutum; a lateral longitudinal patch on mesoscutum above tegula, 0.9 to 1.1 mm. long (one specimen measured 1.4 to 1.6 mm. long); a spot, 0.6 to 0.8 mm. in diameter at apex of mesoscutum; upper 0.5 of epimeron; scattered few hairs on mesosternum; outer surface of fore, mid and hind tibiae (extending almost or quite the full length on the fore and mid tibiae, about 0.5 the length of the hind tibia); scattered few hairs on fore metatarsus; broad transverse bands, continuous on first dorsal metasomal segment except for a median roundish or squarish apical notch, continuous on second to fifth dorsal metasomal segments except for a longitudinal band in the middle. Wings dark fuliginous.

Male.—Similar to the female except for the usual sexual differences and as follows: fore wing about 11 mm. long; supraclypeal area with keeled frontal line about 0.4 length of face; flagellar segments two to ten each with a shallow subovate indentation on posterior surface; lateral border of malus not serrated, apical spine of malus about 0.1 length of malus; median ventral angle at about 0.5 on hind femur.

Specimens examined: ♀, Cotabato. Cotabato, October 2, 1953, H. Townes (Townes Collection). 2 ♀♀ and 1 ♂, Kolambugan, Mindanao. C. F. Baker (U.S. National Museum). 2 ♀♀ and 1 ♂, Mount Canlaon at 3600', Negros Oriental, May 1, May 7 and

May 9, 1953, H. M., and D. Townes (writer's collection). ♀, Mount Canlaon at 4200', Negros Oriental, May 11, 1953, H. M., and D. Townes (Bureau of Plant Industry at Manila).



EXPLANATION OF FIGURE

Fig. 1-5, posterior margin of scutellum; figs. 6-8, lateral aspect of male gonostylus.

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- A REVISION OF THE GENUS MEGARTHROGLOSSUS JORDAN AND ROTHSCHILD. 1915 (Siphonaptera: Hystrichopsyllidae). By Eustorgio Mendez. Vol. 11, No. 3, pp. 159-192, 14 text figs. Published July 26, 1956. Price 85 cents.
 A REVISIONAL STUDY OF THE BEES OF THE GENUS PERDITA F. SMITH, WITH SPECIAL REFERENCE TO THE FAUNA OF THE PACIFIC COAST (Hymenoptera: Apoidea), Part II, by P. H. Timberlake. Vol. 11, No. 5, pp. 247-350, including pls. 27-41. Published August 24, 1956. Price \$2.00.
 HISTOLOGY OF THE OVARY OF THE ADULT MEALWORM TENEBRIO MOLITOR L. (Coleoptera: Tenebrionidae), by Loren L. Schlottman and Philip F. Bonhag. Vol. 11, No. 6, pp. 351-394, including pls. 42-50. Published September 14, 1956. Price \$1.00.
 A CLASSIFICATION OF THE FIRST INSTAR LARVAE OF THE MELOIDAE (Coleoptera), by J. W. MacSwain. Vol. 12, pp. i-iv + 1-182, including 30 pls. Published July 10, 1956. Price \$3.00.—HUGH B. LEECH.

THE SPECIES OF CRICOTOPUS MIDGES LIVING IN THE
BLUE-GREEN ALGA NOSTOC IN CALIFORNIA

(Diptera: Tendipedidae)

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Recently R. L. Usinger and E. M. Brock, of the University of California at Berkeley, sent me for determination a series of midges which they reared from the disclike colonies of the blue-green alga *Nostoc parmelooides* Kützing. In late summer this alga forms dense patches along several miles of Sagehen Creek¹ in the Sierra Nevada near Hobart Mills, Nevada County, California. Dr. Usinger informs me that it is almost impossible to find a colony of this alga which does not contain a midge larva or pupa in some stage of development. The purpose of this paper is to report on the identities of the midges collected and reared by Mr. Brock, who is preparing a report on the biological relationships of this seemingly obligate association.

The material received for determination consisted of large larvae and pupae taken on 15 August, 1953 and 30 July, 1954, and of male and female adults of two new species of *Cricotopus* reared from the alga in August and September, 1954. Although adults of the two species do not have the prominent white-banded legs, pale-banded abdomen, or whitish genitalia characteristic of *Cricotopus* in the strict sense, the presence of dense pubescence on the eyes, absence of macrotrichia on the wing, absence of distinct erect hairs arising from obvious punctures on the mesonotum, and presence of a complete fringe of hairs on the squama place both species in *Cricotopus*, Group C of Edwards (1929), with species formerly referred by various authors to *Trichocladius* Kieffer.

The larvae of some species of *Cricotopus*, including *exilis* Johannsen and *fugax* (Johannsen), live in silken tubes on the rocky bottoms of shallow, swift-flowing streams (Johannsen, 1937). Those of a second group of species, including *trifasciatus* (Panzer) and *sylvestris* (Fabricius), live in silken tubes within feeding channels which they make through one epidermal layer and into the mesophyll of various aquatic plants. Species of this

¹ Acknowledgment is made to the University of California (Sagehen Creek Experimental Wildlife and Fisheries Project) and to the Max C. Fleischmann Foundation of Nevada which made these studies possible.

group are important pests of rice wherever it is grown (Risbec, 1951). Larvae of a third group of species including *brevipalpis* Kieffer, *elegans* Johannsen, and *flavipes* Johannsen, are true leaf miners between the epidermal layers of aquatic plants such as water lilies and *Potamogeton* (Berg, 1950). Larvae of the first and second groups have long antennae, while those of the second and third groups have a pair of long hair tufts on the sides of each abdominal segment. The *Nostoc*-dwelling larvae belong to a fourth group, apparently not previously recognized, having short antennae and no hair tufts.

Berg (*loc. cit.*), in his excellent account of the biology of *C. flavipes*, which mines in several species of *Potamogeton* in Michigan, reported that he was unable to find small larvae of this species in the leaf mines, but discovered what he reasonably assumed, on the basis of morphological similarities, to be younger larvae of the species living in longitudinal excavations in *Potamogeton* stems. The following quotation from Berg shows how the leaf-mining habit may have been developed from alga-feeding species and also how the combined needs of food and shelter may be satisfied in different ways in related species or during various stages of a single species:

"Besides providing evidence concerning the mode of hibernation of *C. flavipes* and the form and habitat of its younger larvae, the discovery mentioned supplies indications that these young larvae may utilize a type of food which is quite unusual among mining insects. Each mine that was opened contained quantities of algae which were identified by Wm. Randolph Taylor as *Nostoc*, *Anabaena*, *Tolypothrix*, *Oscillatoria*, *Schizothrix*, and *Rhopalodia*. These algae appeared to be alive and in good condition. Since each mine opened to the exterior by at least one hole through the epidermis, it is possible that the larvae brought small pieces of living filaments into the mines, and that the algae were growing as rapidly as they were being eaten. Unfortunately, no recognizable material was found in the stomachs of freshly killed larvae."

***Cricotopus nostocicola* Wirth, new species**

(Figures 1, 2)

Length 4.3 mm. by 0.7 mm.

Male. Color entirely black, membranous portions of body including halteres brownish black; wings somewhat milky, veins blackish; antennal plume black. Last antennal segment 1.3 times as long as preceding 12 segments combined. Palpal segments with lengths in proportion of 20:30:30:40. Legs, except on fore tibia and tarsus, with abundant long hairs, length of hairs up to 2.3 times diameter of segments. Fore leg with segments from femur distad in proportion of 90:110:64:38:28:20:15; fore basitarsus thus

0.58 times as long as tibia. Both claws on each leg pectinate at apex; empodium minute. Wing with costa very slightly produced beyond end of R4-5; mediocubitus forking distinctly beyond r-m crossvein. Scutellum with long hairs. Abdominal segments with abundant, long, black hairs arising from coarse punctures. Genitalia as figured (fig. 1a), a small but distinct anal point present; basistyle with a large mesal lobe which is bare dorsally but finely setose ventrally; dististyle stout, blunt apically.

Female. As in the male with usual sexual differences. Color dark brown where the male is black, but pronotum, mesonotum, except for the usual three broad, dark brown vittae, pleura, except for two dark spots, cerci and most of abdominal venter obscurely yellowish. Hairs on legs and abdomen shorter than in male. Antennal flagellum six-segmented (proportions 16:10:13:14:16:40). Spermathecae two, pyriform, each with heavily sclerotized neck arising at postero-ventral end (fig. 1c). Fifth, sixth and seventh sternites each with a mesal patch of moderately long, appressed, black hairs. Cerci (fig 1b) with central ends bluntly rounded.

Holotype male, SAGEHEN CREEK NEAR HOBART MILLS, NEVADA COUNTY, CALIFORNIA, 2 September, 1954. E. M. Brock (type No. 62838, U.S.N.M.). Allotype, five male and two female paratypes, same data except dates 25 August to 2 September, 1954. Paratypes are deposited in the collections of the Academy of Natural Sciences of Philadelphia, the California Academy of Sciences at San Francisco, and Cornell University at Ithaca, New York.

The entirely dark legs and abdomen will separate *nostocicola* from all described Nearctic species of *Cricotopus* except *oceanicus* (Packard), *infuscatus* (Malloch) and *fuscatus* (Wirth) from which it differs in its dark halteres and the uniformly black color of the male.

The following descriptions of the immature stages of *nostocicola* are made from a vial of preserved colonies of *Nostoc* in the U.S. National Museum collection from Pine Creek, Spirit Lake Ranger District, Columbia National Forest, Oregon, 24 February, 1938, A. Roth, collector. Each colony contained a single large larva or pupa of *Cricotopus*, and by boiling gently in dilute caustic the larva or pupa inside could be relaxed and restored for identification. Several colonies contained pupae mature enough that the species could be recognized by male and female genitalic characters. The last larval skin was always to be found inside the colony close by the pupa, thus enabling one definitely to associate larval, pupal and adult characters of this species.

Pupa. Length about 7 mm. Prothoracic respiratory organs lacking. Second abdominal tergite with a very narrow, transverse band of fine shagreen on posterior margin. Lateroposterior corners of ninth tergite produced

caudodorsad in a pair of curved, black-tipped, conical lobes with armature of numerous, small, blunt, dorsally directed, black spines. All other known species of *Cricotopus* pupae possess prothoracic respiratory organs and none has this peculiar armature of the ninth tergite.

Larva. Length about 8 mm. when mature. Head nearly black, body yellowish-white; thorax slightly violet-tinted in large larvae. Hair tufts on sides of body segments lacking. Four slightly tapering anal gills present, each nearly as long at its base as diameter of segment. Preanal dorsal papillae short, each bearing about six bristles about as long as posterior prolegs.

Head greatly down-curved and tapered anteriorly, its dorsal length in profile about twice its length on ventral midline; with two eyespots, the ventral one slightly anterior to, and much smaller than, the dorsal one on each side. Antenna (fig. 3b) very short, first segment 1.2 to 1.6 times as long as broad, with sensory pore beyond middle to slightly proximad of middle of segment. First antennal segment with the longer, hyaline blade at apex greatly exceeding tip of fifth segment, the second blade minute. Torma, or "premandible" (fig. 3c) stout, with two broad, rounded anterodistal lobes. Mandible (fig. 3d) very stout, with several deeply marked wrinkles on dorsal convex side and a long mesal brush arising near base. Hypostomal or "labial" plate (fig. 3a) strongly convex transversely, with a broad, toothless mesal portion much elongated, flanked on each side by six or seven small lateral teeth.

Cricotopus fuscatus Wirth, new species

(Figure 2)

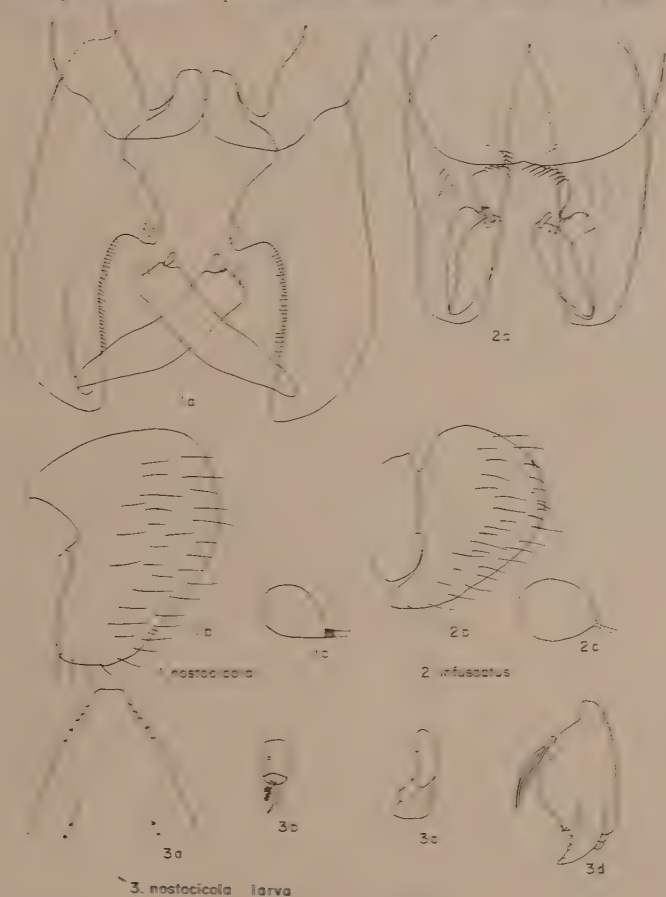
Mr. Brock also reared a second new species of *Cricotopus* from *Nostoc* colonies. Adults of this species closely resemble those of *nostocicola* in structure, but can be readily distinguished by the following characters:

Color paler, both males and females with body bright yellow, the three mesonotal vittae reddish brown, a small black spot at the posterior end of each lateral vitta just in front of scutellum; postscutellum black except narrowly yellow at base; flagellum of antenna, palpus, legs, except coxae, trochanters and proximal half of middle femur, dorsum of abdomen and eighth and ninth sternites of female, dark brown; wings grayish in transmitted light, milky by reflected light; halteres yellowish. Female abdomen with prominent median tufts of long pale hairs on sternites 6 and 7; cerci (fig. 2b) with ventral ends quite narrowly tapered; spermathecae (fig. 2c) oval, the bases of the ducts without sclerotized necks. Male genitalia (fig. 2a) with two small setose lobes on each basistyle.

Holotype male, SAGEHEN CREEK NEAR HOBART MILLS, NEVADA COUNTY, CALIFORNIA. 31 August, 1954. E. M. Brock (type No. 62857, U.S.N.M.). Allotype female, 11 male and 10 female paratypes, same data as type. Paratypes are deposited in the collections of the Academy of Natural Sciences of Philadelphia, the California

Academy of Sciences at San Francisco, the Cornell University at Ithaca, New York and Illinois Natural History Survey at Urbana.

This species is very closely related to *injuscatus* (Malloch) from Illinois which also has the two setose lobes on the male basistyle. Malloch's species, however, has the mesonotal vittae



EXPLANATION OF FIGURES

Fig. 1. *Cricotopus nostocicola*. FIG. 2. *C. injuscatus*. a. male genitalia; b. female cercus; c. female spermatheca. FIG. 3. *C. nostocicola* larva. a. hypostomal plate; b. antenna; c. torma; d. mandible.

glossy black and the legs with more extensive pale markings, with the fore coxa, trochanter, the bases of all femora, the mid and hind tibiae and bases of their tarsi, greenish yellow. I am greatly indebted to Dr. Selwyn S. Roback of the Academy of Natural Sciences of Philadelphia for pointing out the specific nature of these differences in color.

The 15 August, 1953, collection from Sagehen Creek consisted of one female pupa of *nostocicola* and one female pupa of *fuscatus* both of which after clearing in phenol could be identified by the internal genitalic characters of the developing imago, as well as three larvae which could not be determined to species. The 30 July, 1954, collection consisted of one male and four female pupae of *nostocicola*, two female pupae of *fuscatus* and two male and two female pupae too immature for genitalic characters, as well as 26 larvae which could not be specifically determined. Known pupae of *nostocicola* and *fuscatus* could not be separated specifically, and no doubt the larvae of both species were present although no characters were found to separate any of them.

The larvae of *nostocicola* and *fuscatus* are indistinguishable from those which Johannsen (1937, p. 75) described and figured as "*Spaniotoma* sp. G." Henry Dietrich of Cornell University kindly made available to me two of Johannsen's larvae slides from Cos Cob, Connecticut, and also one larva on a slide collected from *Nostoc* in the Callowash River, Oregon, by P. R. Needham, all determined as "*Spaniotoma* sp. G" by Johannsen and agreeing with the larva of *nostocicola*.

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NEW CURCULIONIDAE (COLEOPTERA) FROM
BRITISH COLUMBIA. II.

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The following species, new to science, were sent to the author for identification by Mr. G. Stace Smith of Creston, British Columbia, to whom the author is indebted for type material.

***Ceutorhynchus squamosulus* Sleeper, new species**

Male.—Oval, robust; black throughout; very densely clothed with coarse prominent white setae and broad, flat, oblong, white scales; the white scales on flanks of prothorax and ventral side, a few scattered ones on elytra. *Rostrum* longer than head and pronotum, slender, cylindrical, strongly curved, with a sharp, narrow, median carina and two lateral carina in basal two-thirds, inferior carina forming upper margin of scrobe; sulci between the carinae deeply, finely, and confluent punctured in basal two-thirds; apical third smooth, shining and finely punctured; base to insertion of antennae densely clothed with setae. Antennal insertion just beyond middle, scape attaining eyes; funicle 7-segmented, first segment robust and elongate, as long as the third and fourth combined, second elongate, one-half longer than third, third and fourth segments subequal. Club oval, robust, finely pubescent. Head coarsely, deeply and densely punctured. Eyes flat, completely hidden in repose. *Prothorax* one-fourth wider than long, the sides convergent to apex, the basal constriction very feeble; pronotum coarsely, deeply, and densely punctured, sparsely clothed with white setae which are longer and finer than those on elytra; an entire median channel present, much deeper basally and apically. Scutellum small, narrow, linear, densely punctured, clothed with a few white scales. *Elytra* about one-fifth longer than wide, the sides feebly arcuate in basal three-fourths, then strongly convergent to apex; striae punctures deep, rounded, and close-set, each with a recumbent white seta; intervals flat, coarsely and closely punctured, each puncture with white seta, a few with broad white scales. *Ventral side* densely clothed with white scales; abdominal segments coarsely and closely punctured, first abdominal segment feebly, longitudinally impressed at middle, fifth with a large deep transverse fovea which is limited laterally by prominent tubercles which are clothed with very fine erect setae; pygidium feebly concave, densely clothed with fine, long, erect setae. Legs densely clothed with coarse white setae and white scales, the white scales very few on tibiae, apical third of tibiae clothed with much finer and longer setae. Femora armed with an abtuse tooth. Middle and posterior tibiae unguiculate. Fourth tarsal segment shorter than second and third combined. Claws divergent, armed with a long tooth. Length 3.4 mm., width 1.8 mm.

Female. Differs from the male in that the first abdominal segment is convex and not impressed, the fovea is lacking from the fifth segment and the rostrum is more slender and smoother. Length 3.5 mm., width 1.9 mm.

Holotype, ♂, Creston, British Columbia, V-13-53, G. Stace Smith and allotype ♀, Creston, B.C., V-6-53, G. Stace Smith, in the author's collection. Seven paratypes as follows 1 ♂, V-10-54, 1 ♂, V-12-53 in the author's collection; 1 ♂, 1 ♂, V-10-54, 1 ♂, V-12-54, 1 ♂, V-16-54, 1 ♂, V-11-53, in G. Stace Smith collection. All material from Creston, B.C., G. Stace Smith collector. Length of paratypes 3.2–3.5 mm., width 1.7–1.9 mm. Swept from *Thlaspi arvease*.

This species is very close to *C. subpubescens* LeConte, from which it differs in the much coarser and whiter pubescence, and the absence of a limiting ridge on the lateral margins of the fovea on the fifth abdominal segment.

Phytobius squamipennis Sleeper, new species

Male.:—Oval, robust; black, with femora and tibiae reddish brown annulated with black; densely clothed with brown, and white oblong, flat, depressed scales and a few scattered recurved narrow reddish brown setae; the white scales in a prominent patch immediately behind scutellum and on flanks of prothorax and head, the elytra mottled with white and brown scales. *Rostrum* as long as pronotum, robust, cylindrical, very feebly curved; coarsely, deeply, and densely punctured, a few punctures confluent and forming short strigae. Antennae inserted at apical third of rostrum; funicle 6-segmented; first segment robust, elongate, as long as following two combined; second and third segments subequal, the remainder moniliform. Club ovate, robust, and densely pubescent. Head coarsely, deeply and densely punctured; a short median carina present in front of apical margin of prothorax; front concave, eyes and supra-orbital ridges prominent. *Prothorax* two-thirds wider than long, the sides parallel in basal two-thirds, then moderately constricted to apex; pronotum coarsely, closely, and deeply punctured; median channel entire, deeper basally and apically; lateral and apical tubercles very prominent and acute. Scutellum very minute, scarcely visible at 90×, denuded, shining. *Elytra* slightly longer than wide, the sides parallel in basal half behind humeri, then evenly rounded to apex; humeri rounded; striae deeply impressed, stria punctures rounded, narrowly separated, each with a flat scale; intervals convex, with widely separated asperites. *Ventral side* moderately clothed with white and brown scales. Prosternum without any evidence of antecoxal ridges and deeply emarginate. Abdominal segments coarsely deeply punctured, 1–4 very sparsely clothed with white scales, fifth densely clothed; second abdominal segment deeply impressed at middle, the fifth segment with a small, round, smooth spot at middle of apical margin; remaining segments convex. Pygidium convex, deeply and densely punctured. Femora unarmed. Middle tibiae strongly unguiculate, the remainder not unguiculate. Fourth tarsal segment slightly longer than second and third combined. Claws simple, divergent. Length 2.1 mm., width 1.2 mm.

Female.:—The abdominal segments are unmodified and all tibiae are

not unguiculate, otherwise not differing from the male. Length 2.25 mm., width 1.3 mm.

Holotype, ♂, allotype, ♀, CRESTON, BRITISH COLUMBIA, XI-5-50, G. Stace Smith, in the author's collection. Seventeen paratypes as follows: in the author's collection, 3♂♂, 3♀♀, same data as holotype; in G. Stace Smith Collection, 6♂♂, 4♀♀, same data as holotype, 1♀, Creston, B.C., X-1-44, G. Stace Smith. All examples, with the exception of the 1944 specimen, were collected "on dry log, *Populus*."

The species will key in Dietz (1896) to *P. gracilipes* (Dietz). It differs from *gracilipes* in that the scales on the pronotum are narrower, the lateral and apical tubercles are much more prominent, the dorsal channel is entire and deeper, and abdominal segments 1-4 are sparsely clothed with scales (in *gracilipes* all segments are evenly clothed with scales). This species differs from *P. griseus* (Blatchley), other than by range, in that the rostrum is more robust, the median channel of the pronotum is entire and deep, and the vestiture is mottled on the elytra.

The author has observed that in most examples of *Phytobius gracilipes* (Dietz) all the intervals of the elytra are asperate and only a few females have the last ventral abdominal segment with a small glabrous space. No males are known.

When Dietz (1896) defined the genus *Pelenomus* Thompson (North American species under that genus are now considered as *Phytobius*) he stated that only the hind tibiae of the males have a small mucro. I have found that the males of all species except *gracilipes* (Dietz) have the middle tibiae strongly unguiculate.

Blatchley and Leng (1916:457) state that according to Champion (1907:151) the claws of the genus *Pelenomus* (our *Phytobius*) have a short acute tooth. Champion mentioned that *P. cavifrons* LeConte has a short acute tooth. All the members of the genus with the exception of *cavifrons* have simple and divergent claws. *P. cavifrons* differs greatly in general habitus from the other North American members now included in this genus and should, perhaps, be separated from them.

***Mecopeltus ventralis* Sleeper, new species**

Male.—Oval, robust; black, with antennae dark reddish black, tibiae and tarsi reddish brown; moderately clothed with white, gray, black and yellowish, robust, flattened and pointed depressed scales and very fine depressed reddish setae; the gray scales in part condensed in a feeble sutural line. *Rostrum* much longer than pronotum, cylindrical, very robust

and slightly arcuate, very densely and coarsely punctured, many punctures confluent, the base clothed with reddish brown setae. Antennae inserted near apical third; scrobes rapidly descending, not directed toward eye; funicle 6-segmented, first segment elongate and robust, second and third shorter, subequal, the remainder moniliform. Club ovate, finely moderately pubescent. Head coarsely, deeply, and densely punctured; front deeply concave, a spot of white scales at center of depression; eyes and supra-orbital ridges very prominent, eyes strongly convex. *Prothorax* much more than one-half wider than long, sides strongly arcuate and convergent, apical constriction feeble; lateral and apical tubercles moderately prominent, apical margin between tubercles emarginate; pronotum coarsely, deeply and densely punctured; median channel present, becoming suddenly deeper apically, sparsely clothed with reddish setae, bottom of channel with closely placed white scales; flanks densely clothed with white and yellowish scales. Scutellum very minute, scarcely visible. *Elytra* ovate, sides parallel in basal half behind humeri, then arcuate to apex; humeri evenly rounded; striae deeply impressed with deep rectangular punctures about their length apart; intervals convex, moderately asperate, intervals 3, 5, and 7 very strongly elevated above others. *Ventral side* densely clothed with yellowish, brown, and white scales; posternum with prominent antecoxal ridges; first and second abdominal segments very deeply impressed at middle, second segment with a very dense patch of black scales at middle, fifth segment with a small, feeble, oval fovea and with a dense patch of fine white setae at middle of apical margin; pygidium convex, deeply, densely and coarsely punctured. Legs annulated with black, the annulated areas clothed with reddish setae, remainder clothed with white scales, except apical half of tibiae which are clothed with coarse, intermixed white and black setae. Femora unarmed. Middle and posterior tibiae moderately unguiculate. Third tarsal segment broadly bilobed; claws simple and strongly divergent. Length 2.5 mm., width 1.5 mm.

Female.—It differs from the male only in the structure of the abdominal segments and tibiae. All the abdominal segments are strongly convex and without fovea or other modification. Middle and posterior tibiae are not unguiculate. Length 2.5 mm., width 1.5 mm.

Holotype, ♂, allotype, ♀, CRESTON, BRITISH COLUMBIA, V-16-53. G. Stace Smith, in the author's collection. Thirty-six paratypes as follows: in the author's collection, 6 ♂♂, 6 ♀♀, same data as holotype; 10 ♂♂, 7 ♀♀, same data as holotype. Creston, B.C., 2 ♂♂, V-17-53. 2 ♂♂, V-18-53. 1 ♂, V-21-53. 2 ♂♂, VI-5-53, all collected by G. Stace Smith. All examples were collected in wet moss.

This species will key in Dietz (1896) to *aeneosquamosus* Dietz, but may be separated easily by the more strongly convex eyes, the deeper concavity on the front, and the more strongly arcuate pronotal margin between the apical tubercles. The males can be

easily separated by the deeply impressed first ventral abdominal segment, and the dense patch on the fifth abdominal segment.

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A NEW PREY RECORD FOR THE GENUS CERCERIS

(Hymenoptera: Sphecidae)

The following note is of some significance since, to the author's knowledge, it represents the first record of a tenebrionid beetle taken as prey by a member of the tribe Cercerini. In the United States, known prey records for this tribe include members of the families Curculionidae, Chrysomelidae and Buprestidae. Some European species of *Cerceris* are known to provision their nests with solitary bees.

On June 23, 1956, at Mecca, Riverside County, California, the author observed a single female *Cerceris athene* Banks (det. H. A. Scullen) transporting a tenebrionid beetle in flight. The wasp was flying over a sandy waste area adjacent to an irrigated melon field. It settled near an open hole in the rather moist sand and was about to enter when captured. The beetle, subsequently identified as *Eurymetopon rufipes* Eschscholtz (det. T. J. Spilman), was clasped closely to the wasp's underbody, venter up and head directed anteriorly. It appeared to be completely paralyzed, the antennae and legs showing no movement when touched. The burrow of the wasp was excavated but no other prey were found. An extensive stand of *Heliotropium curassavicum* L. was in bloom nearby, but no adult wasps were found on the flowers. However, a short distance away, on August 15, 1956, a series of about 40 specimens was taken on flowers of *Croton californica* Mull. A few individuals were collected at Thermal, Riverside County, on flowers of *Melilotus alba* Desr. in early July and a single specimen from Blythe, Riverside County, in the collection of the California Insect Survey bears the label "*Tamarix gallica*."—M. S. WASBAUER, *University of California, Berkeley*.

NOTES ON THE SUBGENUS CHELOSTOMOIDES OF THE
GENUS MEGACHILE LATREILLE

(Hymenoptera: Apoidea)

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The recent article by Mitchell (1956:129-138) on *Chelostomoides* prompts me to make the following corroboration and addition to the synonymy there given. In the Catalog (Muesebeck, et al, 1951:1182-1183), Michener places *M. discorhina* Cockerell as a synonym of *M. pratti* Cockerell, and cites *M. chilopsidis* Cockerell under the name of *M. longula* Fox. In his discussion Mitchell describes the distinguishing characters of the *pratti* male and the putative male of *discorhina*, and suggests that *pratti* should become a synonym of *chilopsidis*, with restoration of the name *discorhina* for the other species. Although Mitchell does not cite this synonymy as positive in the discussion, he nevertheless accepts it in the accompanying key. In view of the facts that *chilopsidis* (with *pratti* male) ranges from Texas to Arizona and rarely intrudes into the deserts of California, whereas *discorhina* is abundant in the deserts of California and extends no further east than Arizona, where it is less common than *chilopsidis*, the synonymy suggested and tentatively used by Mitchell may be accepted as certain.

Mitchell has recorded only three females of *M. felipiana* Mitchell. The type is from San Felipe Valley, San Diego County, California, and the two other specimens are from Magnesia Canyon, Riverside County, and the Santa Rita Mountains, Pima County, Arizona. In my collection is a series of six females and one male of this species collected at Bahia de los Angeles, Baja California, Mexico, on *Frankenia palmeri*, May 15, 1949 (R. C. Dickson). The male is *M. browni* Mitchell which was described earlier from Yuma, Arizona. As there are no discordant elements in the characters and range of the two sexes, I believe that *felipiana* should be placed in synonymy with *browni* (*new synonymy*).

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ADDITIONS TO THE DISTRIBUTION OF NORTH AMERICAN
NEMESTRINIDAE: WITH NOTES ON VENATIONAL
VARIATION

(Diptera)

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The large collections of Nemestrinidae accumulated in recent years by the Department of Entomology and Parasitology, University of California, at Berkeley and Davis, are the main source of the records listed below. I wish to thank Dr. Paul D. Hurd, Jr., and Mr. A. T. McClay for the opportunity to examine this material, most of which was collected on Mexican Expeditions sponsored by the Associates in Tropical Biogeography, University of California, by Paul D. Hurd, Jr. (P.D.H.), E. E. Gilbert (E.E.G.), and C. D. MacNeil (C.D.M.). A few records from other sources are included.

1. *NEORHYNCHOCEPHALUS SACKENII* (Williston)

CALIFORNIA: Fandango Pass, Modoc County, July 6, 1950 (H. E. Cott).

IDAHO: Lewiston, Nez Perce County, June 25, 1952 (E. I. Schlinger).

GEORGIA: Leesburg, Lee County, August 13, 1932 (L. K. Gloyd). This is the first record from the state and the most eastward known locality for the species.

MEXICO: Ahuacatlán, State of NAYARIT, July 18–22, 1951 (P.H.D.). This is the first Mexican record of the species.

Attention should be called to the valuable contributions to the bionomics of *N. sackenii* by G. T. York and H. W. Prescott (1952, *Jl. Econ. Entom.*, 45, pp. 5–10) and by G. T. York (1955, *Op. cit.*, 48, p. 328), in Montana, where the species was previously unknown.

2. *NEORHYNCHOCEPHALUS VOLATICUS* (Williston)

TEXAS: Palmetto State Park, Gonzales County, May 2, 1953 (B. J. Adelson).

MEXICO: NUEVO LEON: 4 miles east of El Cercado, June 6, 1951 (P.D.H.). —TAMAULIPAS: Altomira Farm, M. E. Hoag—Ac. N. S. Phila.)—JALISCO: 8 km. west of Tequila, July 18, 1951 (P.D.H.).—VERA CRUZ: Cuitlahuac, June 22, 1951 (P.D.H.); Vera Cruz, June 20, 1951 (P.D.H.).—PUEBLA: 16 miles southeast of Acatlán, 4800 ft., July 10, 1952 (E.E.G. and C.D.M.).—OAXACA: Oaxaca, July 8, 1952 (E.E.G. and C.D.M.); 47 miles southeast of Oaxaca, 3000 ft., July 14, 1952 (E.E.G. and C.D.M.); 58 miles southeast of Oaxaca, 3600 ft., July 14, 1952 (E.E.G. and C.D.M.); Juchitán, 18 miles west of Oaxaca, July 20, 1952 (E.E.G. and C.D.M.).—GUERRERO: Acapulco, June 21, 1935 (A. E. Pritchard).—CHIAPAS: 72 miles southwest of Tuxtla Gutiérrez, 2500 ft., July 27, 1952 (E.E.G. and C.D.M.).

insects, in which the wing is often the only part available or sufficiently preserved for detailed analysis. Before attempting to appraise the significance of venational characters, the paleontologist should become acquainted with the types and frequency of variation in the most closely related recent forms.

Both the species discussed below show a decided tendency toward the formation of supernumerary cross-veins at seemingly haphazard points in the apical field of the wing. Such extra cross-veins are a normal feature in some other members of the family. The tendency eventually culminates in the relatively few species of *Nemestrinus* and *Moegistorhynchus*, where the apical third to half of the wing is more or less reticulated. Without entering into any further discussion of the subject, I may state that this reticulation, which is exceptional in the family, is in my opinion a secondary specialization, not a primitive characteristic, as has been sometimes claimed. It has no particular bearing on the original venation of the immediate ancestors of the order Diptera. Paleontology offers no real clue as to what the venation of the ancestral Diptera may have been. All known fossil Diptera, including the known fossil Nemestrinidae, lack all trace of reticulation in the wing. This is also true, moreover, in those Recent families of Diptera which from the body morphology and anatomy of larva and adult are generally regarded as the most primitive living forms of the order.

Venational Variation in *N. volaticus*

Although hardly two specimens of this species are alike in every detail of venation, Fig. 2A of a ♂ from St. Augustine, Florida, may be regarded as fairly normal. In the apical third of the wing, the 1st and 2nd submarginal cells (1st R_{2+3} and 2nd R_3) are separated by a cross-vein connecting the 2nd longitudinal vein (R_{2+3}) with the upper branch (R_4) of the 3rd longitudinal; the 2nd and 3rd submarginal cells (2nd R_3 and R_4), as well as the 1st and 2nd posterior cells (R_5 and M_1), open broadly in the apical margin of the wing at the costa; the 3rd submarginal cell (R_4) is connected by a broad base with the 1st submarginal (1st R_3).

The most instructive series studied consists of 3 ♀♀ and 4 ♂♂ collected the same day at Vera Cruz. Only two of these have a normal venation. The apical fields of four of the others are shown in Figs. 2B-E. In three flies the 2nd submarginal cell (2nd R_{2+3})

is closed and stalked far from the margin, but the other cells open broadly on the costa (Fig. 2C); in addition, in one of these, the cross-vein dividing the 1st and 2nd submarginal cells is lacking (Fig. 2B). In two flies the 2nd submarginal is open on the costa, while the 2nd posterior cell (M_1) is closed and stalked before the margin in one (Fig. 2D) and almost closed in the other (Fig. 2E). All five flies show the same aberrations in both wings with only minor differences. It should be stressed that all seven Vera Cruz flies are conspecific and true *N. volaticus* in every other structural and color character. The aberration shown in Fig. 2D is of particular interest in that a closed and stalked 2nd posterior cell is a normal feature of the related *Neorhynchocephalus sackenii* (Fig. 3A).

Of 15 specimens caught the same day near Tequila, Jalisco, 12 are nearly normal, except that the 3rd submarginal cell (R_1) is sometimes stalked at the base. In one ♂ the 2nd submarginal cell (2nd R_3) is closed and stalked before the margin in both wings; in two other ♂♂ the tip of the upper branch of the 3rd longitudinal vein (R_4) is obliterated, the vein stopping in the membrane a short distance from the costa, and in one of these, this upper branch is also partly obliterated near mid-length.

A ♂ from Juchitán, Oaxaca, has the 2nd submarginal cell (2nd R_3) closed just at the costa in the left wing and broadly open in the right.

A ♀ from 58 miles southeast of Oaxaca has the 1st posterior cell (R_1) closed and stalked before the costa in the right wing (Fig. 2H) and narrowly open at apex in the left wing. Otherwise this specimen agrees with two ♀♀ and one ♂ with normal venation, taken with it.

A ♀ from Cuiclahuac, Vera Cruz, has the 3rd posterior cell (2nd M_2) divided by a nearly vertical supernumerary cross-vein at about the basal third in both wings.

A ♀ from Chichen-Itzá, Yucatán, has a supernumerary cross-vein dividing the 2nd posterior cell (M_1) at about mid-length in the left wing (Fig. 2G); the right wing is normal.

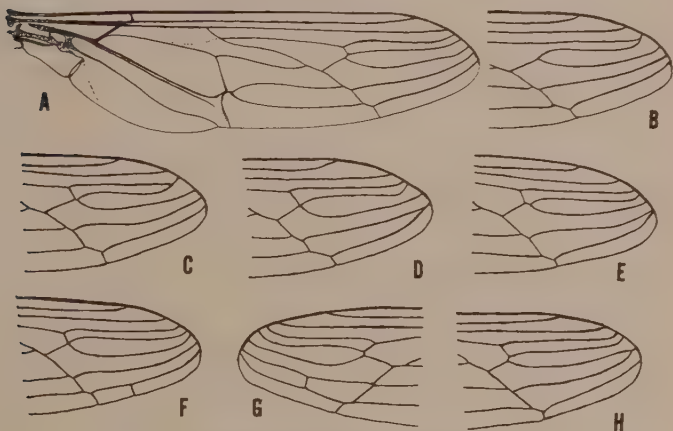
A ♂ from Raymondville, Texas, lacks the cross-vein dividing the 1st and 2nd submarginal cells (2nd R_3 and R_4) in the left wing; the right wing is normal.

A ♀ from Hidalgo County, Texas, has the 2nd submarginal cell closed exactly at the costa in the left wing; the right wing

is normal.

In a ♂ from Archer, Alachua County, Florida, the 2nd submarginal cell is stalked before the margin in the left wing; the right wing is normal.

Of 19 specimens from Monticello, Florida, 17 are normal. In one ♂ the 2nd submarginal cell is stalked before the margin in the right wing, normally open in the left. In another ♂ the 3rd posterior cell (2nd M_2) is divided by a nearly vertical super-numerary cross-vein at about the basal third in the right wing (Fig. 2F); the left wing is normal.



EXPLANATION OF FIGURES

Fig. 2, *Neorhynchocephalus volaticus* (Williston): A, St. Augustine, Fla., normal venation; B-H, wing tips with abnormal venation: B-E, Vera Cruz, V.C.; F, Monticello, Fla.; G, Chitzen Itzá, Yuc.; H, southeast of Oaxaca, Oax.

The 141 specimens of *N. volaticus* examined for this study came from the entire range of the species, which is known to extend from Kansas, Missouri and Florida in the north to Guatemala in the south. Of these, 17, or approximately 12 per cent, are conspicuously abnormal in the apical field of the wing, either in one or in both wings. This is rather a high percentage as compared with venational variations in most other Diptera under natural conditions.

The venation of the basal two-thirds of the wing appears to be less variable than the apical field, except for the base of the

4th posterior cell (M_3). In some flies (Fig. 2A) this cell is stalked at the base, the stalk, variable in length, being inserted close to the lower apical corner of the 2nd basal cell (2nd M). In others, the upper and lower margins of the cell (M_2 and Cu_1) end together at this corner opposite the 5th longitudinal vein (Cu), so that five veins meet at one point. In one ♀ from Willard, Missouri, the lower margin (Cu_1) of the 4th posterior cell starts below the apical corner of the 2nd basal cell, the 4th posterior cell being contiguous over a short stretch with the anal cell (1st A).

Venational Variation in *N. sackenii*

The variation in this species was discussed at some length, but not illustrated, in two earlier papers (J. Bequaert, 1930. *Psyche*, 37:293-294; and 1934, *Jour. New York Ent. Soc.*, 42:170-171). Normally (Fig. 3A) the 2nd posterior cell (M_1) is closed and stalked before the costa; but the stalk is sometimes very short (Fig. 3B), or the cell may be closed just at the margin or even narrowly open there. The other cells of the apical field usually open broadly on the costa. The base of the 3rd submarginal cell (R_4) often forms a short cross-vein at the tip of the 1st submarginal cell (1st R_3).

In a ♀ from Salt Lake City, Utah, the 3rd submarginal cell (R_4) is divided by a supernumerary cross-vein, near the basal third of the cell, in the right wing (Fig. 3C); the left wing is normal.

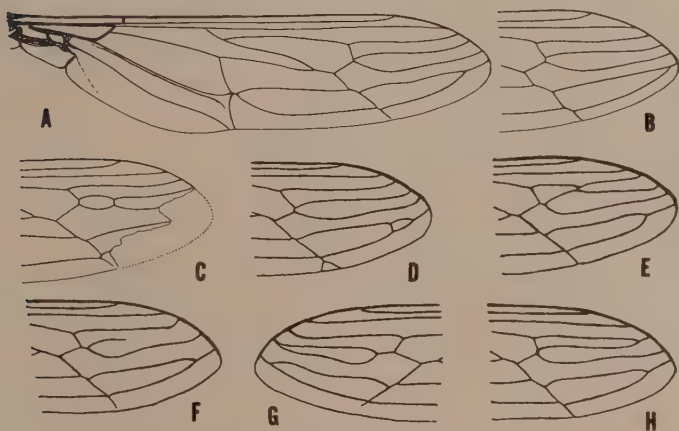
In the right wing of a ♂ from Fort Huachuca, Arizona, the closed 2nd posterior cell is divided at the tip by a short cross-vein; while the terminal section of the "diagonal vein" is forked, producing a small, triangular cell at the lower margin of the wing (Fig. 3D); the left wing is normal.

In both wings of a ♀ from Spanaway, Washington, the 2nd submarginal cell (2nd R_3) is divided near the basal third by a short extra cross-vein connecting the 2nd longitudinal vein (R_{2-3}) with the upper branch of the 3rd longitudinal (R_1); in addition the 3rd submarginal cell (R_4) is briefly stalked at the base, instead of contiguous with the 1st submarginal cell (Fig. 3E).

Both wings are abnormal in a ♀ from Logan, Utah. In the right wing (Fig. 3F), the upper branch of the 3rd longitudinal vein (R_4) is mostly obliterated, being developed only over less than the basal half; the 3rd submarginal cell (R_4) is briefly stalked at the base. In the left wing (Fig. 3G), the 3rd sub-

marginal cell (R_1) has a long basal stalk, but is narrowed into a point over the apical half, the two branches of the 3rd longitudinal vein (R_4 and R_5) being almost fused before the costa. In both wings the terminal section of the "diagonal vein" is shortened, ending far from the hind margin of the wing.

In a ♂ from Cheyenne County, Kansas, the right wing has the tip of the 2nd submarginal cell (2nd R_3) closed and connected with the costa by means of a stalk as long as that of the 2nd posterior cell (M_1); in the left wing, the 2nd submarginal cell (2nd R_3) is much narrowed apically and barely opens on the costa.



EXPLANATION OF FIGURES

Fig. 3, *Neorhynchocephalus sackenii* (Williston): A, Goose Lake, Calif., normal venation; B-H, wing tips with abnormal venation; B, Huachuca Mountains, Ariz.; C, Salt Lake City, Utah; D, Fort Huachuca, Ariz.; E, Spanaway, Wash.; F-G, Logan, Utah, right and left wing; H, Quincy, Calif.

A series of 39 flies (34 ♂♂ and 5 ♀♀) taken at Quincy, California, from June 25 to July 6, 1949, are the largest single population sample I have seen thus far of any American nemestrinid. The venation may be called normal in 35 of these flies, although the stalk of the 2nd posterior cell (M_1) varies from long (as in Fig. 3A) to short (as in Fig. 3B). It is abnormal in the four remaining flies, or 10.2 per cent of the total. In one ♂ the 2nd posterior cell (M_1) of the right wing is not stalked, but

opens narrowly on the costa, the venation being otherwise normal; the tip of the left wing is missing. The other three flies have a stalked 2nd posterior cell. In a second ♂ the 2nd submarginal cell (2nd R_{3+4}) is closed before the costa, with which it is connected by means of a moderately long stalk, in the right wing (Fig. 3H); in the left wing, the 2nd submarginal cell is closed just at the costa, and, in addition, the 3rd submarginal cell (R_4) is divided by an extra cross-vein at about mid-length of the cell. In the third ♂ the apical area of the left wing is mostly missing; in the right wing, the 3rd submarginal cell (R_4) is divided by an extra cross-vein slightly before mid-length of the cell, and the cell is sessile at the base. In one ♀ the right wing is normal; in the left wing the 3rd submarginal cell (R_4) is divided by an extra cross-vein placed as in the preceding ♂, and the cell is also sessile at the base.

A total of 82 specimens of *N. sackenii*, from British Columbia, Washington, Oregon, California, Utah, Colorado, Arizona, Kansas, Missouri, Arkansas, Georgia, and Nayarit (Mexico), were examined for the present study. Of these, eight, or 9.7 per cent. have a decidedly abnormal venation, a slightly lower percentage than for the larger sample of *N. volaticus*. The sample is too small in either case, however, to conclude that the venation is actually less or more variable in each of these two species.

A NORTHERN EXTENSION OF RANGE FOR ENDEODES
BASALIS LECONTE
(Coleoptera: Malachiidae)

On August 15, 1956, I collected nine specimens of this species from beneath dried seaweed on the sandy beach at Seaside, Monterey County, California. Previously, this species has been recorded only from south of the Big Sur region, which is thought to be a barrier for many seashore forms. This new record now shows that the ranges of *E. basalis* and *E. collaris* overlap. They are, however, not closely related, and inhabit different ecological niches.—IAN MOORE, *San Diego Natural History Museum*.

NOTES AND DESCRIPTIONS OF NEW CALIFORNIA BOMBYLIIDAE

(Diptera)

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The deserts and mountains of California are particularly rich in Bombyliidae, especially the former areas. As far as can be ascertained there have been no comprehensive works dealing with the bee fly fauna from this arid region. Priddy (1939) published a list of the species collected in southern California, but his list represents approximately only 10 to 15 per cent of the actual numbers present. It is the hope of the author that he may, in some way, contribute to the knowledge of the bee fly fauna through articles such as this. A much more comprehensive work is planned for the future, dealing mainly with the bombyliids of California.

The following notes and descriptions are presented at this time in order to facilitate the return of borrowed material and to make the names available for use elsewhere. All of the species described herein are from California, the types are all located in the collection of the California Academy of Sciences, San Francisco, California.

The following three closely related genera belong to the subfamily Cylleniinae, as set forth by Bezzi, 1924. They may be recognized by the prominent bilobed occiput, second longitudinal vein originating at an acute angle, with four posterior cells, anal cell open, tibiae without bristles (a few feeble ones occasionally present), and a more or less bare elongated abdomen. The following key will serve to separate the three genera:

1. With three submarginal cells, ocellar tubercle located near vertex *Amphicosmus* Coquillett
 With only two submarginal cells.....2
2. Ocellar tubercle situated near middle of front; third antennal segment rather broad, tapering to a point which may or may not be narrowly truncate *Metacosmus* Coquillett
 Ocellar tubercle situated near the vertex; third antennal segment with apex distinctly truncate..... *Paracosmus* Osten Sacken

Genus AMPHICOSMUS Coquillett

In 1923 Cole described the female of an unique species which he named *Amphicosmus vanduzeei*; it was collected at Palm Springs, California. No mention of the species has been made since that time, nor had the author seen any specimens other than the

type. It is a rather small inconspicuous fly and a rather slow flyer, which could very easily account for its not being readily seen and collected. There are two other species within the genus, one *elegans* Coquillett described from California, the other *cincturus* Williston described from Mexico. I give below a key to separate the known species of this small genus.

Key to species of *Amphicosmus* Coquillett

1. Legs partly black; first antennal segment black.....2
 Legs entirely yellowish; first antennal segment of female yellow, of male black; posterior margins of abdominal segments yellowish
 *vanduzeei* Cole
2. Femora with base and apex yellowish; basal portion of abdomen reddish*elegans* Coquillett
 Femora entirely black, abdomen black, except for posterior margins of segments*cincturus* Williston

Cole's type female of *A. vanduzeei* is known from only one specimen. I have before me seven specimens from the desert region of California. I hereby designate the following specimen, the description of which is given below, as the allotype male, Borego, San Diego County, California, April 28, 1955 (P. H. Timberlake).

Allotype male: Eyes separated by width of ocellus, which is situated slightly anterior to vertex, a slightly elevated weal runs from ocellus to vertex; front black, silver pollinose, white pilose; face black, shining between and in front of antennae, lower portion of face whitish-yellow, except near eye margin, an elongate spot of same color below each antenna, silver pollinose and white pilose on sides below antennae; antennae black, white pilose above and below, segments one and two equal in length, third segment broad, elongate, longer than basal two together, tip truncate, arista wanting; eyes with smaller facets on lower half, but without a division line; proboscis black, with short white hair below and on labellae; palpi black with white hair, about one-third as long as proboscis; occiput black, silver pollinose.

Thorax and scutellum shining black, with short white hair tomentum wanting; anterior half of thorax with two silver pollinose stripes which extend half way back on dorsum, another similar spot on upper anterior side of pleura which extends from anterior callus to root of wings, both pollinose areas confluent anteriorly, thorax and scutellum without bristles; pleura shining black, bare except for a silver pollinose spot overlaid with white pile in front of halteres. Coxae black with white hair, legs entirely orangish, except last three tarsal segments and a small spot at apex on anterior surface of femora, black, entire legs with white hair, longer on femora, bristles wanting; pulvilli large, pad-like nearly as long as claws; halteres with stems and knobs white; squamae rather small, white, with white fringe. *Wings* hyaline, costa, subcosta and first vein yellow to junction with second vein; other veins yellow basally, brown apically; small cross-

vein slightly beyond middle of discal cell. *Abdomen* shining black, posterior margins of all segments yellowish-white, decreasing in extent posteriorly, short white pilose, longer on segment one, tomentum wanting; venter like dorsum, only first three segments visible, tergites of segments four to seven completely cover their counterparts on venter; pygidium moderately large, ninth tergite orange, pygidial segments with small white hairs.

The male differs from the female only slightly; in the latter the front and face are not as extensively silver pollinose; the dorsum of the thorax is not vittate, and the humeral callosus are yellowish.

Material examined was collected at Borego, San Diego County, California April 27, 1955, April 28, 1955 (R. Schuster, M. Wasbauer, P. H. Timberlake); Near Parker Dam, three miles N. Crossroads, San Bernardino County, California, April 22, 1951 (G. F. and C. D. MacNeill).

PARACOSMUS Osten Sacken

The genus *Paracosmus* was originally described by Loew as *Allocotus*. *Allocotus* was preoccupied so Osten Sacken in Western Diptera (p. 262) changed the name to *Paracosmus*. Melander (1950) gives a short discussion of *Paracosmus* in which he mentions the striking similarity and intergradation between *edwardsii* and *morrisoni*, the two commonest representatives of the genus. The new species described below appears to be very closely related to these two species, but is easily separated on the basis of the shape of the third antennal segment, color of face and by the smaller size and shape of the genitalia. It will run to couplet three in Melander's key.

Paracosmus similis Hall, new species

Male: Eyes narrowly separated; front entirely silver pollinose, white pilose; ocelli shining black, black pilose; face silver pollinose on upper half, lower half shining black, a few white hairs on underside below eyes, otherwise bare; proboscis not projecting, black; palpi brownish with long white hairs; antennae black, first two segments subequal with short black hair, third segment equal to basal two together, broadest beyond middle, apex distinctly truncate; occiput dull black below, upper half sparsely silver pollinose.

Thorax, dorsum shining black, two silver pollinose stripes run length of notum, confluent in front with lateral stripes running posteriorly over root of wings, all four stripes meet posteriorly in a large pollinose spot, pollinose areas covered with short, fine, white hair, longer and more snow-white in front and on sides; pleura shining black, bare except a few white hairs in front and below halteres, a silver pollinose stripe runs obliquely backward from base of fore coxae to end above halteres, another stripe runs upward from hind coxae to end behind halteres; coxae and trochanters black, tip of

all coxae silver pollinose, bare except for a few short, fine hairs; legs orange, base of front femora dark, extreme apex of all femora and tibiae on dorsal surface black, tarsi black, first segment lighter; pulvilli large, slightly shorter than claws; squamae white with white fringe; halteres with stem and base of knob brownish, apex of knob white; scutellum dull black, covered with short, fine whitish hair. *Wings* hyaline, veins pale-brown, r-m crossvein beyond middle of discal cell, petiole of third vein equal to apical portion, anal cell narrowed apically. *Abdomen* dull black, hind margins of all segments white, margins on segments six and seven very narrow, abdomen bare except for a tuft of white hair on sides of first segment; segments two to five sparsely silver pollinose when viewed from in front, more obvious on segments four and five; venter black, with short, fine, black hair on posterior margins of all segments, confined to middle of margin on segment one; genitalia large, entirely black, segments with black hair, paraprocts coming together over top, hiding dististyli and aedeagus.

Female: Very much like the male, with the usual sexual differences in addition to the front not pollinose except next to eyes, frontal pile black; dorsal thoracic vittae narrow and incomplete; hind margins of abdominal segments very narrowly white, wanting on segment seven.

Holotype male and allotype female taken at WESTGARD PASS, INYO COUNTY, CALIFORNIA, July 10, 1953 (E. G. Linsley). Two male paratypes with the same data, one in author's collection, the other in the collection of the University of California at Berkeley.

Paracosmus insolens Coquillett was described from the male only. I have before me twelve specimens of which six males agree with the description of *insolens*; the other six, which are females, differ only slightly from the males. On the basis of this, coupled with the fact that they were collected together, leaves me little doubt of the association of the sexes. I herewith give a redescription of the male, together with the description of the female, which I designate as the allotype.

PARACOSMUS INSOLENS Coquillett

Male: Eyes separated slightly more than width of ocelli; ocellar tubercle located at vertex, a single ocellus located one-fourth the way down front; front black, densely silver pollinose, short white pile on lower half, bare up to ocelli; face conically projecting, silver pollinose on upper half only, short, fine, white hairs along oral margin, lower half of face bare, shining brownish; antennae black, basal segments subequal, third longer than basal two together, broadest before or at middle, tapering to pointed apex, a few white hairs on underside of segment two only; proboscis black, not projecting; palpi lighter with a few long white hairs; occiput black, silver pollinose on sides and partly below, upper part to vertex shining black, white pilose.

Thorax shining black, short, sparse white pile on disc, longer and more abundant on anterior edge and sides in front of wing base: front part of thorax with two silver pollinose spots extending backwards to root of wings,

posterior end of spot deeply bifurcate giving impression of two stripes; another silver pollinose spot in front of scutellum extends onto base of scutellum; pleura black, bare except for patch of white hair on propleura and in front of halteres, a silver pollinose stripe runs from propleura backwards above coxae to beyond halteres; legs black, knees yellowish, short white pilose; hind tarsi somewhat brownish; pulvilli large, pad-like; squamae yellowish with white fringe; halteres with stems and knobs white; scutellum shining black, a few minute hairs on sides at base. *Wings* hyaline, veins yellowish-brown, r-m crossvein slightly beyond middle of discal cell, petiole of third vein slightly longer than apical portion, anal cell narrowed apically. *Abdomen* black, entire posterior margin of segment one broadly yellowish, segment two with yellowish color forming triangle on posterior margin, smaller on segment three, segments four to six with posterior margins only narrowly yellowish, long white pile on side of first segment, rest of abdomen white pubescent, all segments silver pollinose, extending nearly to lateral margins; venter bare, shining black, basistyli bulbous, shining black, eighth tergite drawn out, on lower portion, into a long slender projection extending backward and hiding dististyli.

Allotype female: Differs very slightly from the male. It may be recognized by the following diagnostic characters: Front shining black, silver pollinose above and at sides of antennae only; face silver pollinose on sides of upper half, bare and shining black in middle; anterior edge of thorax shining black prealar callosus silver pollinose; front tibiae yellowish on undersurface; r-m crossvein beyond middle of discal cell; petiole of third vein slightly shorter than apical portion; abdomen shining black without silver pollen; hind margins of all segments bright yellow, short pubescence yellowish, genitalia covered by dense whitish hair. Otherwise like the male.

Allotype female from Borego, San Diego County, California, April 27, 1955 (M. Wasbauer). Material examined was all collected at Borego on the following dates: April 1, 1953, April 2, 1953, April 24, 1955, April 27, 1955 by P. D. Hurd, M. Wasbauer, and R. Schuster.

Genus *LORDOTUS* Loew

The genus *Lordotus* has long been a favorite with the author. In 1954 he published a revision of the group. Since that time only a single new species has been found. This new species was collected on the Colorado Desert, a favorite locality of the genus. Many species are to be found in the desert regions and it is not unlikely that there are several more new forms yet to be discovered. It is with a great deal of pleasure that I name this species in honor of Dr. P. D. Hurd who has done much to aid the author in his study of the Bombyliidae.

Lordotus hurdi Hall, new species

Male: Entirely black, tibiae and first tarsal segment light, face grayish to light brownish pilose, lower part of face and under eyes with white hair,

tomentum wanting; antennal segment one nearly three times as long as segment two, with black hair above and brownish hair below; segment two nearly as broad as long, with black hair above and below; segment three much longer than basal two together, evenly tapering from base to apex; occiput white pilose and tomentose; dorsum of thorax and scutellum with erect whitish pile, tomentum wanting; pleura brownish white pilose, metapleura bare, tomentum wanting; coxae yellowish-white pilose; femora whitish pilose and tomentose, middle femora with a series of black hairs in middle on anterior surface; tibiae whitish tomentose, bristles black, a long yellowish spur at apex of middle tibia; tarsi with fine whitish scales above, bare below; squamae white with white fringe; halteres, stems yellow, knobs white; basicosta whitish pilose, costa without denticulations; wings hyaline, basal half of veins yellow, apical half brown; abdomen uniformly white pilose, destitute of tomentum; venter entirely white pilose; tomentum wanting, last sternite enclosing genitalia, yellowish.

Female: Front white pilose and tomentose; face white pilose; dorsum of thorax when denuded shows three faint grayish vittae, white tomentum, overlying the vittae, when viewed from above, forms three vague stripes, tomentum longer and more dense on posterior end, pile and tomentum generally whiter than in male, anterior surface of middle femora with only a few short black hairs; abdomen white tomentose, denser on posterior margins of segments two to four and on a median dorsal line, extending from segments one to four, segment five densely covered with white tomentum. Otherwise identical to male.

Holotype male and allotype female, BOREGO, SAN DIEGO COUNTY, CALIFORNIA, April 1, 1953 (P. D. Hurd). Paratypes: 4 females, 3 males topotypic, 2 females, 1 male in author's collection, 2 females, 1 male in collection of U.C. at Berkeley, 1 male Mojave, Kern County, California, April 24, 1919 (C. D. MacNeill).

L. hurdi runs to couplet 13 in the key to the males and to *albidus* in the key to the females in my previous paper on this genus. In the males *hurdi* can be easily separated from *juncus* by the yellowish tibiae and lack of tomentum on the abdomen. The female of *hurdi* can be separated from the female of *albidus* by the wholly black femora and the black pile on the upper side of the antennae.

In making determinations of various beetle collections, the *Aphoebantus* group has given the author a good deal of trouble. Their easily rubbed pile and tomentum and the lack of non-variable characters among the more closely related species have made their determination difficult at times. The author has been aided in a large part by the availability of the large, well classified collection of Dr. A. L. Melander. Melander's paper on *Aphoebantus* while excellent in many respects still leaves much to be desired. A good

number of species have been based on single specimens, not only by Melander but earlier workers as well, this has led to confusion mainly when attempting to associate the sexes. Quite often the opposite sex of one species looks more closely related to another than it does to its mate. In order to more fully understand the relationships within the genus, much larger series of each species, preferably from various localities, need to be studied. The amount and extent of variation of several characters used for separation has never been adequately established, partially because of the lack of sufficient material for study.

Of the new form described below it gives me great pleasure to name it in honor of Mr. E. I. Schlinger, who, through his tireless efforts, has been of considerable aid to the author in many ways.

***Aphoebantus schlingeri* Hall, new species**

Female: Front black with brownish-yellow pile and tomentum, the latter very dense; face grayish pollinose beneath a dense covering of pale yellow pile and white tomentum; palpi black with pale yellow hairs; antennae black, first segment more than twice as long as second, third with bulbous base, not strongly constricted, nearly as long as apical styliiform portion, basal segments with brownish-yellow hairs above, pale yellow ones below; occiput black, dense white scales on lower portion extending upward to slightly beyond eye emargination, scales on upper portion and vertex yellow.

Thorax subshining black, densely covered with brownish scales, with short hair of same color, a narrow white tomentose stripe extends from anterior humeri over root of wings to posterior humeri, bristles pale (not black); scutellum subshining black, evenly and densely covered with brownish tomentum, a patch of white scales on side at base, bristles pale; pleura black, white tomentose, pile wanting except on propleura and upper part of mesopleura which is white; coxae black, white pilose and tomentose, a few yellow hairs at apex of middle coxae; femora black, apex and all of tibiae and tarsi pale yellowish-brown, bristles of the same color, hind femora with a few short bristles apically and moderately long hairs basally on ventral surface; halteres stems yellow, knobs white; wings hyaline, first posterior cell slightly narrowed, no stump of a vein at angle R_{3+4} , angle at base of third posterior cell with a small stump extending into discal cell; basicosta with white scales and black setulae. *Abdomen* black, without black scales, entirely covered with brownish tomentum, hind margins of segments one to six with a band of whitish scales, wide on segment one and decreasing in extent posteriorly, short pale yellow pile over-all, lateral tuft of white pile at side of segment one; venter black, white pilose and tomentose.

Male: Differs very little from the female, it may be recognized by the silvery pollinose front and face with fine pale yellow pile; occiput entirely pale white tomentose except for a few yellow scales at vertex; anterior

portion of thorax with long white scales; hind femora with long hairs but no bristles on ventral surface, some hairs are bristle-like; abdomen with abundant, erect, white pile, lateral margins of all segments white tomentose; genitalia not large, with white pile and tomentum; no stump of a vein at base of third posterior cell; otherwise like the female.

Holotype female, DAVIS. YOLO COUNTY, CALIFORNIA. Sept. 4, 1955 (E. I. Schlinger); allotype male, Davis, California, Sept. 3, 1955 (A. D. Telford). Seventeen paratypes in the University of California at Davis collection, and in the collection of the author. They were collected at various dates at Davis.

In one specimen the frontal and facial pile and tomentum is white, in other specimens the whitish incisures of the abdomen are represented by a concentration of fuscous scales on the posterior margin. The bristles on the hind femora in the female may be represented by one to six bristles. The abdominal tomentum varies from a dirty white to a fuscous color.

The male of *A. schlingeri* runs to couplet 53 in Melander's key. It may be separated from *marcidus* Coq. and *micropyga* Mel. by the difference in color of pile and tomentum, the rather narrow apex of the first posterior cell and in the shape and color of the pygidium. The female on the other hand runs to couplet 56 where it doesn't exactly fit either choice; the female can be made to key out to *hians* Mel. by stretching a point or two, but a comparison cannot be made as the female of *hians* is unknown.

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A NEW GENUS OF EUPLECTINI FROM CALIFORNIA

(Coleoptera: Pselaphidae)

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The following account is an addition to the pselaphid fauna of the western United States resulting from an intensive search for micro-coleoptera of the lesser known families made in partial conjunction with the California Insect Survey.

Tetrascapha Schuster and Marsh, new genus

Type of genus: *Tetrascapha dasycerca* Schuster and Marsh, new species.

This genus is distinguished by the following combination of characters: (1) Antennae eleven segmented, not geniculate, the last three segments forming a club; (2) Head without frontal rostrum; (3) Vertex with two, small, nude, perforate foveae; (4) Ventral surface of head with few monaxial, non-capitate setae; (5) Pronotum with lateral sub-basal teeth; disk sub-basally trifoveate, one near each marginal tooth and one median; four basal longitudinal carinae; (6) Prosternum medially tumid; (7) Subhumeral fovea and epiplural sulcus of elytron absent; (8) Seven visible sternites in the male and six in the female; male with sexual modifications of the third ventral and fourth and fifth dorsals; (9) Mesocoxae contiguous; (10) Tarsi of three segments, the first small, the last two elongate with the second longest, the third bearing a long claw and distinct accessory.

Tetrascapha dasycerca Schuster and Marsh, new species

Male. Head 0.33 mm. long $\times$ 0.37 mm. wide; pronotum 0.41 $\times$ 0.39; elytra 0.70 $\times$ 0.71; total length 1.83 mm.

Integument rufotestaceus, sparsely punctate; vestiture short, fine. *Head* with large eyes of about forty facets; tempora rounded angulate, two times eye width; median cervico-occipital carina extending apically, terminating in a small depression slightly posterior to vertexal foveae; two, small, nude, vertexal foveae anterior to posterior margin of eyes, separated by two times the distance from fovea to eye; vertexal foveae connected by a shallow impression extending between antennal tubercles; antennal tubercles distant, moderately developed; antennae verticillate, club as illustrated (Fig. 2); frons gently convex; maxillary palpi as illustrated (Fig. 3); ventral surface of head with fine, apically decumbent, non-capitate setae and a small apical depression bisected by a median longitudinal carina. *Pronotum* widest before middle; lateral margins smooth, not crenulate; small sub-basal tooth near each lateral basal angle; disk trifoveate, two, large, nude foveae located anterior to lateral teeth; a small, nude, median fovea at the basal fifth; strong median sulcus extends from median fovea to base; median sulcus bordered by two short carinae, two longer carinae equidistant between these and basal angles as illustrated (Fig. 1). *Prosternum* medially

tumid, lacking carina. *Elytra* with prominent, rounded humeri; each elytron with three foveae, median fovea arising at base of entire sutural stria, two lateral foveae at base of common longitudinal impression extending one-fourth elytral length; subhumeral fovea and epipleural sulcus lacking. *Abdomen* with five visible tergites, the first with basal emargination as illustrated (Fig. 4), the fourth apically sinuate, the fifth bearing two dense tufts of setae as illustrated (Fig. 6); seven visible sternites, the first six as illustrated (Fig. 5), the third with a distal transverse median laminate structure, the seventh a longitudinal penial plate. Genitalia as illustrated (Fig. 7). Legs with tibiae distally enlarged but lacking structural modifications; tarsal claw of prothoracic leg cleft.

Female. As in the male but lacking the sexual abdominal characters and with only six visible sternites; claw of proleg not cleft.

Holotype male taken from leaf litter at MENDOCINO, MENDOCINO COUNTY, CALIFORNIA on October 10, 1954 by J. R. Helfer. Additional specimens in the type series, all from Mendocino County, were taken by J. R. Helfer on the following dates: Little River, 14♂♂, 27♀♀, May 3, 1955; Mendocino, 3♂♂, 1♀ Oct. 20, 1954, 1♀ May 25, 1955.

The male holotype is deposited in the California Academy of Sciences; paratypes in the collection of Orlando Park, the California Insect Survey, and the California Academy of Sciences.

This genus is most closely allied to the Trogastrina by virtue of contiguous metacoxae, accessory tarsal claws, and no frontal rostrum. Other characters shared with *Oropus* of the above mentioned subtribe are a pronotum armed with small subbasal lateral teeth and modifications of the fourth tergite in the male.

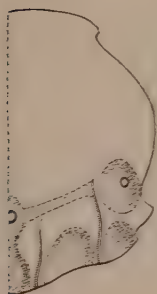
Further relationship is to be found with the new subtribe Trisignina of Park on the basis of similar tarsal claws and meso and meta coxae but differing in having a simple prosternum, six sternites in the females, and no subhumeral foveae.

One other characteristic of note, namely the laminate modification on the third sternite of the male, is somewhat reminiscent of an identical structure in *Morius*, presently a far removed genus in the Rhinoscepsina.

Unless the present status of the Trogastrina is enlarged to accommodate this genus, such characters as seven sternites in the

EXPLANATION OF FIGURES

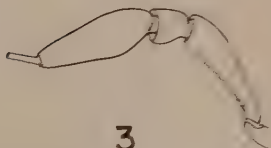
Figs. 1-7, male of *Tetrascapha dasycerca* Schuster and Marsh, new species. Fig. 1, pronotum. Fig. 2, antennal club. Fig. 3, maxillary palpus. Fig. 4, first visible tergite. Fig. 5, first six visible sternites. Fig. 6, fifth visible tergite. Fig. 7, lateral aspect of genitalia.



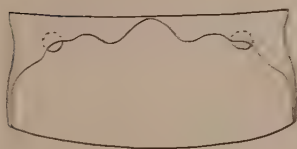
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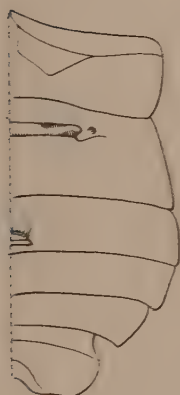
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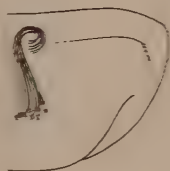
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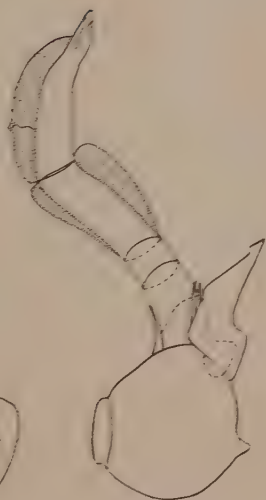
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male, a lack of subhumeral fovea, a few non-capitate hairs on the ventral surface of the head, and four parallel basal pronotal carinae would seemingly warrant a new subtribal status. However, until such a time when the Euplectini *sensu latiore* are further studied, this genus is tentatively placed near the Trogastrina.

ZOOLOGICAL NOMENCLATURE: NOTICE OF PROPOSED USE OF THE PLENARY POWERS IN CERTAIN CASES FOR THE AVOIDANCE OF CONFUSION AND THE VALIDATION OF CURRENT NOMENCLATORIAL PRACTICE. (A.(N.S.) 37)

Notice is hereby given that the possible use by the International Commission on Zoological Nomenclature of its Plenary Powers is involved in applications relating to the under-mentioned names included in Parts 6 and 7 of Volume 13 of the *Bulletin of Zoological Nomenclature*, which will be published on 28th June, 1957:

(a) *Application in Part 6 of Volume 13*

- (1) *Oeobia* Hubner, [1825]: and its emendation *Oebia*, suppression of (Class Insecta, Order Lepidoptera) (Z.N.(S)1149).

2. Attention is also drawn to the proposed adoption of *Declarations*: (a) clarifying and extending the provisions of the "Code of Ethics" (Z.N.(S)763); (b) determining the gender to be attributed to generic names having the terminations "-ides," "-ites" and "-oides" (Z.N.(S)951); (c) clarifying the procedure to be adopted when a specific name is published in an abbreviated form (Z.N.(S)1042); (d) clarifying certain problems arising in connection with names published in works written in Latin (Z.N.(S)1223).

3. The present Notice is given in pursuance of the decisions taken on the recommendation of the International Commission on Zoological Nomenclature, by the Thirteenth International Congress of Zoology, Paris, July 1948 (see Bull. Zool. Nomencl. 4:51-56, 57-59; *ibid* 5:5-13, 131).

4. Any specialist who may desire to comment on any of the foregoing applications is invited to do so in writing to the Secretary to the International Commission (Address: 28 Park Village East, Regent's Park, London N.W. 1, England) as soon as possible. Every such comment should be clearly marked with the Commission's File Number as given in the present Notice, and sent *in duplicate*.—FRANCIS HEMMING, *Secretary to the International Commission on Zoological Nomenclature*.

BIOLOGICAL NOTES ON A NEW CHALCID-FLY FROM
SEED-LIKE EUCALYPTUS GALLS IN CALIFORNIA¹

R. A. FLOCK

(Hymenoptera)

University of California Citrus Experiment Station, Riverside

A phytophagous chalcid-fly has been reared from *Eucalyptus* in California and is described as *Flockiella eucalypti* Timberlake (1957) in a companion paper. No phytophagous eucalyptus insects have previously been recorded as introduced into California. The many species of *Eucalyptus* in California have been established from seed, and in this way the rich eucalyptus insect fauna of their native Australian region has largely been left behind. The new chalcid-fly causes formation of seed-like galls in the seed capsules and must have been introduced with seed.

The chalcid-fly *Flockiella eucalypti* Timberlake has been found at the University of California Citrus Experiment Station, Riverside, and at Roeding Park, Fresno, California, the only locations in the state where an extensive search has been made.

The chalcid-fly has been reared only from *Eucalyptus umbellata* (Gaertn.) Domin (1928) as determined by Dr. Mildred E. Mahtias. This species has been known as *Eucalyptus tereticornis* Sm. and is one of the important windbreak trees in California, especially in the hotter, drier areas where the blue gum, *Eucalyptus globulus* Labill., does not thrive.

Eucalyptus umbellata is a large tree, growing to a height of about 100 feet. The bark is gray and deciduous, and the leaves are long and slender. The seed capsules are hemispherical, with protruding valves; they are less than 6 mm. in diameter and are formed in clusters of four to eight. The pedicels are less than three times as long as the capsule. The cap is conical, sharp-pointed, and usually two to three times as long as the capsule. The seeds are distinctive, being irregular, partially hollow, and about 1 mm. in diameter.

The adult chalcid-fly is largely dark brassy green, with yellow legs banded with brown. The flies are variable in size, ranging from approximately 1 mm. to 1.8 mm. in length. The adult is active, hops when disturbed, and flies readily. It can live for several days without food or water. No males are produced.

The egg is deposited in small flower buds. Some of the nearby

¹ Paper No. 956, University of California Citrus Experiment Station, Riverside, California.

twigs have been found to be thickened and distorted as if by oviposition injury, but no larvae have been found in them.

The larva is found in a saclike gall which it causes to grow in one of the four cells of the bud. In the early stages this gall is pale green and soft; it enlarges rapidly, however, and before the anthers have become exposed it has occupied most of the cell and replaced the ovules. Especially in the early stages, the cavity in the gall is much larger than the gall insect. When the gall reaches its final size it is thin but hard and is nearly spherical; in color it is light brown with darker markings. The gall resembles the seed and is about one and one-half times as large in diameter.

When the capsule opens, a few of the chalcid-fly galls drop out with the seeds. The majority of the galls remain in the capsule and some of them are permanently attached to its walls. Usually there are one to three galls in a capsule and one gall in a cell. There may be two galls in a cell, however, and six have been found in one capsule. The incidence of infested capsules was greater in October and November than in early spring, but infested capsules were found all year.

The chalcid-fly may emerge from the gall by chewing a circular hole in it. It may also chew a hole to the surface of the seed capsule while it is still green. In this case the gall will be nearly filled with frass from the capsule. The adult fly can then escape from the seed capsule before it opens. At least when the capsule is removed from the tree the adult usually escapes from the capsule after it opens. The chalcid-flies may emerge from the galls over a period of nearly two months after removal from the tree. The galls could be gathered with seed and carried to new locations with the seed or seed capsules. This is presumably the way in which the chalcid-fly was brought into California.

In the fall of 1953 and the spring and summer of 1954 this phytophagous chalcid-fly was extremely abundant in seed capsules from one tree but extremely rare on those from other trees. No parasites were found at that time. However, seed capsules from the same tree collected on March 15, 1955 were heavily parasitized. A small number of capsules collected then yielded seventy-two chalcid-flies as compared to seventy-five gall chalcid-flies. It appears probable that this parasite is ordinarily very efficient in controlling its host.

This insect is probably not of economic importance. The

chalcid-fly was first noticed after seed capsules gathered in October 1953 failed to yield viable seed, but at other times and on other trees, a low percentage has been found to be infested. A closely related chalcid-fly, *Rhynopeltella eucalypti* Gahan (1922), which causes formation of stem galls (Miller, 1921) has almost destroyed the blue gum, *Eucalyptus globulus* Labill., in New Zealand, where the tree had been an important timber tree before the introduction of the insect (Clark, 1938). That chalcid-fly was present for some time before its discovery but the damage was mistaken for that of a fungus.

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CERCERINI COLLECTION NOTES, I.

(Hymenoptera: Sphecidae)

EUCERCERIS SINUATA Scullen

In 1939, this species was described (Oregon State Monog., Studies in Ent. 1:47) from a single female specimen collected at Devils River, Texas, May 5, 1907, on sumach, by F. C. Bishop. Recently, a second female specimen of the above species was found in a collection from the University of California (Berkeley). This specimen was collected at Leon Creek, Bexar County, Texas, Oct. 11, 1952 by B. J. Adelson. The male of this species is unknown.

EUCERCERIS BRUNNEA Scullen

In 1947, this species was described (Pan-Pacific Ent. 24:159-60) from a single female specimen collected at Jacala, Hidalgo, Mexico, 4,500 feet, June 22, 1936, by Ralph Haag. A second female specimen of this species was recently found in a collection

from the University of California (Berkeley). The second specimen was collected at Cerra Teguila, seven miles south of Teguila, Jalisco, Mexico, 6,600 feet., July 8, 1950, by Andrew Browne.

By an error, *E. brunnea* Scullen was omitted from the Synoptic Catalog, Hymenoptera of North America by Muesebeck, Krombein, Townes and others, 1951. The male of this species is unknown.—HERMAN A. SCULLEN, *Oregon State College, Corvallis.*

A PREVIOUSLY UNRECORDED HOST PLANT FOR *PIERIS BECKERII* EDWARDS

(Lepidoptera: Pieridae)

Due to the broad distribution of *Pieris beckerii* Edwards in the arid parts of California, it has long been suspected that the species probably utilizes a variety of foodplants in the larval stage. However, only two have thus far been definitely recorded, *Isomeris arborea* Nutt. (Capparidaceae) and *Brassica nigra* (L.) (Cruciferae).¹

During a California Insect Survey trip into Surprise Canyon, Panamint Mountains, Inyo County, California, two pierid larvae were found on *Stanleya pinnata* (Pursh.) (Cruciferae) on April 25, 1957. One adult male of *P. beckerii* was reared from these and emerged in Berkeley on May 11. Since *Stanleya pinnata* is a relatively geographically restricted plant in California, this would seem to strengthen the presumption that *P. beckerii* feeds on an assortment of cruciferous hosts across its range.

The nearly full-grown larvae were quite conspicuous on the slender, single flowering stalks of the *Stanleya*, seeming to prefer the unopened buds toward the apical end of the spikes.—JERRY A. POWELL, *University of California, Berkeley.*

¹ Coolidge, Karl R., 1923. The Life-History of *Pieris beckerii* Edwards. Ent. News 34: 225-231.